An approach to

ILLUSTRATED

# OPERATIVE SURGERY

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By

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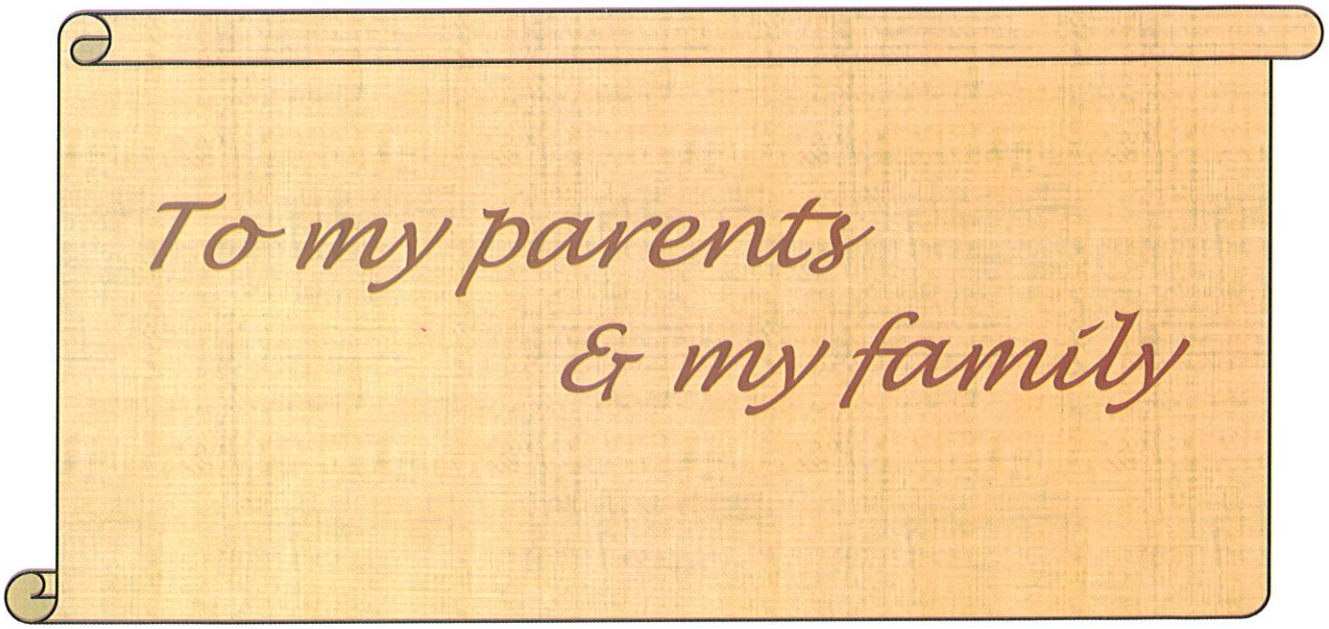
To my parents
& my family

# PREFACE

*The aim of this ( approach to illustrated operative surgery) is essentially to allow proper orientation of candidates towards Operative skills and approaches.*

*I have described only the common conditions that you are likely to see in operative theatre.*

*I believe that the best textbook cannot take the place of a good lecture, yet I also believe that the provision of well-planned illustrations is perhaps, more important in understanding the different -and perhaps also difficult- operative steps than in any other branch of surgery.*

*Hopefully, it will prove its value as a comprehensive reference which can be easily digested during the short terms of clinical training and readily revised in the immediate pre-examination period.*

*The author:*

*A. Hassib*

# ACKNOWLEDGMENT

*All the praise is due to **ALLAH**, who wanted for this work.*

*My profound gratitude is due to all my life & colleges in general & pediatric surgery section, Cairo University for there continuous help and support.*

*I would like to express my deepest gratitude and appreciation to **Dr Farouk Marzouk**, the editor of this book who gave this work mush of his effort and time.*

*I would like to extent my deepest gratitude to **Dr Hisham Haron** the designer of the book illustrations.*

*In this fourth edition, many thanks must go to the following very dear colleagues who believed in my dream and suffered much to realize it.*

- *Ahmad Samy*
- *Akrm Amin*
- *Amr Monir*
- *Yehia Hammd.*

*Finally, I am greatly indebted to my students without whom, this wok would not come to light*

*The author:*

*A. Hassib*

*2010*

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# SURGICAL NEEDLESS & SUTURE MATERIAL

## Surgical needles

➢ **Desirable properties of a surgical needle:**

1) Corrosion resistant material -e.g.stainless steel.
2) Rigid.
3) Ductile.
4) Slime (minimal trauma to the tissues).
5) Sharp point.
6) Method of thread attachment e.g .eye or swage.
7) Stable when grasped and used in an instrument.

➢ **Surgical needle characteristics**

1. **Shape of curvature :e.g.**
   - **1/4 circle**: for ophthalmic & microsurgery,1/2 & 3/8 circle for general use in all tissue.
   - **5/8 circle**: for cardiovascular surgery, oral, nasal & pelvic.
   - **J shaped**: used in femoral hernia.
   - **Straight needle**: for general use but discouraged as hand held.

2. **Needle length and size (*wire diameter*)**
   - Long needles are used for fascia &skin closure.
   - Shorter & finer needles are used in visceral, vascular or fine structure surgery.

3. **Tip & cross section.**
   - ❖ ***There are 3 main types***
     a) **A conventional cutting & reverse cutting,** they are used mainly on the skin, periostum, tendons & sclera.
     **There reverse cutting** is more commonly used as it has less possibility for suture tearing through the tissue being repaired.
     b) **Taper -point needles** They have round bodies that tapers to a sharp point.
     They work well with viscera & most of fascia.
     **c) Blunt needles.**
     Their use is particularly in liver repair & vascular regions and in safer fascial closure.

4. **Attachment to suture materials**
   Needles usually come &reattached to their (swaged) threads.
   Eyed needles are rarely used except in gynecology & in unusual circumstances.

   ▪ **Advantages of swaged needles:**
   1. Minimization of tissue trauma.
   2. Potential reduction of leakage at an anastomotic sites.e.g . vascular surgery
   3. Convenience is improved with minimized needle handling.

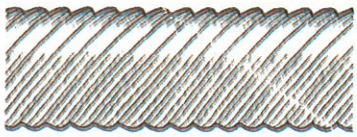
# Suture Material

## Absorbable sutures

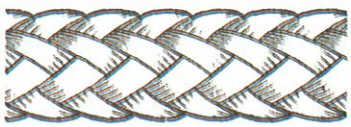
| Name | Formed of | Braided or monofilament | Loses tensile strength after | Absorbable after | Characters |
|---|---|---|---|---|---|
| **Plain Catgut** | Submucosal layer of large intestine | M | 1-2 weeks | 90% after 50 days | • Stiff, hard to tie.<br>• Marked tissue reaction. |
| **Chromic Catgut** | As plain but soaked in chromic acid salt | M | 2-3 weeks | 100% after 80 days | |
| **Vicryl** | Polyglactin | B | 2-3 weeks | 80 days | • Their behaviour is more predictable.<br>• Tissue reaction is not marked. |
| **Dexon** | Polyglycolic acid | B | 2-3 weeks | 120 days | |
| **PDS** | Polydioxanone suture material | M | 4-6 weeks | 6 month | • Since it is mono-filament, it is useful in suturing infected or contaminated wounds. |

## Non absorbable sutures

| Name | Formed of | Braided or monofilament | Characters |
|---|---|---|---|
| **Silk** | Natural silk | B | • **Advantages:** Easy to handle & tied securely in the 3 half knots.<br>• **Disadvantages:** Elicits more inflammatory reactions than others. |
| **Prolene** | Polypropylene | M | • **Advantages:** Much less reaction than silk.<br>• **Disadvantages:**<br>1. Requires 5-6 half knots in an equal degree of security.<br>2. More difficult to handle.<br>3. More exposure. |
| **Ethibond** | Synthetic polyester | B | |
| **Nylon** | Nylon | M or B | |



Twisted suture
e.g. catgut



Braided suture
e.g. Vicryl

Monofilament suture
e.g. Prolene

**Notes:**

1. Catgut is damaged by drying and therefore must be packed wet.
2. Silk is not strictly speaking non absorbable. It loses its tensile strength over 1 year and it is absorbed by the end of two years.
3. All ***braided sutures*** share the drawback of harboring bacteria within the suture interstices protecting it from attack by the body's defenses.
4. All ***monofilament sutures*** are difficult to handle and tie, and hold knots poorly but they are inert and do not tend to harbor bacteria.

## Suture Sizes

- The largest suture available is No. 5
- The sizes are numbered progressively down to No. 1, which is still a heavy suture.
- Below this, suture sizes begin with 0 and progress downward through 00, 000, 4-0 to 10-0.
- In comparison, a strand of human hair would be the same size as a 6-0 to 7-0 suture.

## Suture Size Choices

- For ordinary use, 4-0 through 0 are standard.
- No. 5-0 through 7-0 sutures are used for delicate vascular anastomoses and 8-0 through 10-0 for microvascular work and eye surgery.
- Sizes 0 and 1 are suitable for heavy fascial repair.

## Suture Choices

➢ **The basic principles are:**

- Use an absorbable suture where continued strength is not important, or when infection would make it desirable for the suture to be absorbed.
- Absorbable suture is generally used for the subcutaneous tissue and mucosal layer of the intestine, ligation of small blood vessels & muscles and used in urinary tract.
- Non-absorbable suture is used when tissue reaction should be minimal, when continued strength is desirable, or when the suture will be removed subsequently.
- Non-absorbable suture is used in the skin and in fascial closure, ligation of major blood vessels, hernia repair, repair of nerves, tendons and bones.
- When getting down to the finer points, the choice of suture becomes a matter of opinion.

## Skin Closure

- Use the smallest size suture necessary to maintain closure.
- Most surgeons use either polypropylene or monofilament nylon in the skin, silk is generally considered too reactive for the skin.
- Staples are often used on the skin. Even though they are expensive, they can be rapidly applied and do not cause cross-hatching of the wound. Sutures cut into the skin and cause scarring. Metal staples approximate the skin edges by applying pressure on either side of the wound.

## Suture Removal

- The length of time needed for the suture varies according to the rapidity of wound healing. This depends partly on vascularity and tendency toward edema.
- Different areas heal at different rates. Leave sutures in until the wound is well healed.

➢ **The following general guidelines are helpful:**

- Face, neck & scrotum 4 - 5 days
- Trunk 7 - 10 days
- Upper extremities & hands 10 – 12 days
- Lower extremities & feet 12 – 16 days

# BASIC SURGICAL TECHNIQUES

## I. Sterile technique

➢ **Four principles must be employed for sterile technique**

1) Reduction in contamination of the ambient environment.
2) Disinfection of the procedural site.
3) Sterilization of the procedural equipment.
4) Isolation of the procedural site.
   - Provision of barriers between the procedure list and the patient.
   - Provision of the barriers between the patient and the environment.

### 1. Reduction of environmental contamination:

**A. Clean staff:**

- Masks are required when sterile instruments are opened.
- Hair and beards must be fully covered.
- Staffs are required to change into clean theatre clothing before entering the suite.
- Street shoes must be covered with over-boats or special theatre foot wear are used.

**B. Clean air**

- Minimization of draughts.
- Close theaters laminar air flow environment
- Minimization of extra-personnel and their physical movement within the theatre.

**C. Clean equipment**

- All staff should remain at least one meter from anything covered with sterile drapes

***Do not:***
- Lean or reach over sterile instruments and fields while not gowned and gloved
- Touching sterile personnel &trolleys.
- Dropping non-sterile items onto the operative field or sterile.

**D. Clean hands**

- All theater staff should wear gloves during patient handling and wash their hands and forearms up to the elbow with antibacterial solutions such as povidone-iodine or chloro-hexidine.
- The first scrub of the day should before five minutes and the rest for three
- If allergic to the wash substances, low-irritant antiseptics and normal soap are acceptable alternative

| ***Summary of ACRON guidelines for the surgical scrub*** | |
|---|---|
| **Preparation** | 1. Wear proper attire, cover hair, jewellery off, keep nails, done mask and plastic apron.<br>2. Ensure presence of a sterile scrub sponge and antimicrobial wash solution. |
| **The scrub** | 1. Time scrub for 5 minutes (1st for the day) or 3 minutes (all subsequent scrubs).<br>2. Wet arms to elbow under running water.<br>3. Wash with 2ml of solution for 30 seconds with a circular motion: clean the nails, then rinse.<br>4. Wash again with 2ml between fingers up to elbow, and rinse.<br>5. Wash arms with 2ml and rinse.<br>6. Wash hands with 2ml and rinse.<br>7. Keep hands above elbows, turn off water and enter theatre with hands above elbows still. |
| **Pre-gowning** | 1. Dry hands and arms with a sterile towel-use a quarter for each hand and forearm.<br>2. Grown and glove as appropriate. |
| ***Australian Confederation of Operating Room Nurses (ACRON).*** | |

### Gowning & gloving:

1) The entire surface of every grown and glove is fully sterilized prior to use although forearms, hands and chest region are the only parts of the theatre attire that are considered truly sterile.
2) Powderless gloves are used for abdominal surgery and powder allergic personnel.
3) Double – gloving may reduce the chance of acquiring blood-borne infections from needles stick injuries.

**NB: *Non touch technique:***

1) This method involve the use of instruments alone to manipulate & handle tissues, suture and prostheses, it is used frequently in orthopedics.
2) The gloved hand never touches the tissues or any prosthesis inserted into the body.

| ***Summary of ACRON guidelines for gowning and gloving*** | |
|---|---|
| **Gowning** | 1. Remove the gown from the sterile field and allow it to fall open in front of you.<br>2. Locate the sleeves and work the arms into them.<br>3. Keep hands within the sleeves unless the scrub-nurse is to put on your gloves.<br>4. Allow the back ties of the gown to be tied.<br>5. Once gloved, spin the warp-around tie with other sterile personnel to cover the back of the gown. |
| **Gloving**<br>**(Closed method)** | 1. Pick up the glove, with the right hand through the sleeve material.<br>2. Place it palm-to-palm and thumb to thumb on the upturned left hand.<br>3. Grasp the lower fold of the glove with the left hand, through out the sleeve material .<br>4. Lift the upper fold of the glove over the open sleeve end.<br>5. Slide the hand into the glove.<br>6. Repeat on the right hand. |
| **Removing of gowns** | **1.** Undo the warp-around tie.<br>**2.** Allow the back tie to be undone by other staff.<br>**3.** Put down the gown and remove it first, bundle it and deposit in the linen skip.<br>**4.** Remove the gloves by grasping the cuffs and turning inside out.<br>**5.** Deposit gloves in contaminated disposal bin. |
| ***Australian Confederation of Operating Room Nurses (ACRON).*** | |

## 2. Prepping &draping operative site:

If grossly contaminated by dirt or grease, a traumatic wound may be first washed in a clean rather than sterile manner, to remove macroscopic contamination prior to skin preparation.

- **Prepping:** application of antimicrobial solutions to the site of operation.
- **Draping:** exclusion of the other area with sterile towels or sheets.
  - ***Square draping***

    It is the creation of a quadrilateral space containing the operative field within a combination of four or more drapes.

    *Uses* :applied to the head, trunk and larger diameter of the limbs.
  - ***Shut-out draping***

    It is to expose the distal part of a limb.

    Involves a sterile base sheet, full preparation of the distal limb, application of a drape around the proximal limb to shut-out the non-sterile segment.

    ***NB:*** a combination of the two methods may be required for the middle segment of a limb

**Common preoperative solutions:**

1. Chlorhexidine 0.5% in alcohol 70%.
2. Chlorhexidine 0.5 % and cetrimide 2%.
3. 10% povidoned-iodine solution.
4. Alcoholic-iodine solution & aqueous chlorhexidine 0.5%.

- They all bactericidal activity.
- The operative site is painted with a skin preparation solution starting from the site of the incision &going outwards in a ***spiral*** fashion.
- Drapes are applied & secured after prepping is completed.
- In general, the whole patient-except the head- is covered with drapes & two layer coverage is the minimum standard at any point on the patient.
- A raised sterile curtain is usually placed between two IV poles to separate anesthetist & the surgeon.

➢ ***Instrument issues:***

- Instrument safety is improved by use of the concept that, all instruments and sharps are owned by the scrub nurse &the surgeon is merely"borrowing" them.

➢ ***Theater environment:***

- Distraction such as conversation should be kept to a minimum.
- The surgeon's concentration should not be broken by unnecessary interruptions.

## II. Functions of the surgical team

➢ **The scrub nurse:**

1. To ensure that all instruments needed are available either on operating trolley or close at hand.
2. The instruments and the number of instruments are checked by the circulating nurse.
3. The number of swabs and packs on trolley are counted and noted as well as the suture material needles.
4. To prepare sponge-holding forceps and swabs for preparation of the skin.
5. To check that all swabs and packs are complete before the end of the procedure and report this to the surgeon.

➢ **The medical staff:**

1. The role of the first assistant is to ensure adequate exposure of the operating field for the surgeon.
2. To assist the surgeon in securing homeostasis.
3. To anticipate the requirements of the surgeons and to respond instantly to any requirements or instructions.
4. All members of the surgical team should maintain vigilance throughout the procedure to avoid unforced errors.
5. Minimal number of observers should be warned to stay clear of the sterile field and not to talk or otherwise distract attention of the team.

➢ **Special functions of the assistants:**

1. Retraction: may be done by self-retaining retractors or specific fixed retractors or by the second assistant.
2. Aggressive retraction either by hand or by instrument may tear tissue or cause unwanted hemorrhage.
3. It is necessary for the assistant to hold the retractor gently rather to maintain strong pull on it.
4. The assistant must tell the surgeon when he become fatigue or when the retractor begins to slip.
5. Mopping assistant must keep the field dry and free of blood and body fluids.
6. This should be done as a dab rather a rub, as excessive rubbing will induce further hemorrhage.
7. Sudden hemorrhage is dealt with by applications of pressure on the pack.
8. Hands of the assistant must not cross the field(assistant &not a resistant).

## III. Basic suturing techniques

**a. Simple suture.**

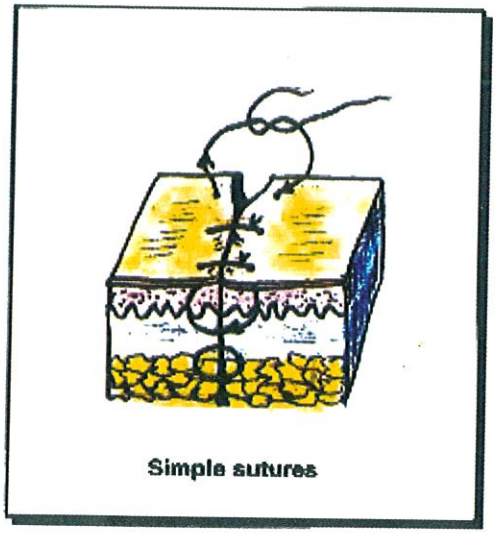
**b. Vertical mattress suture**

- This suture is best used in creases & areas of natural inversion. e.g. the back of a hand or other sites of loose skin.
- Major potential problem is that can cause excessive pressure on tissues.

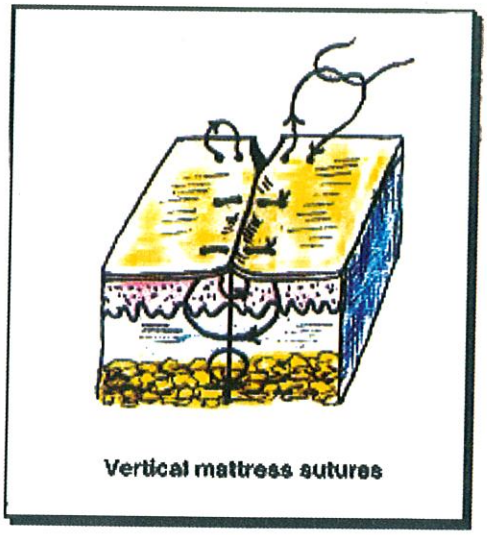
**c. Horizontal mattress suture**

It is of particular use in flexures, on the back of hands & any site with loose skin.

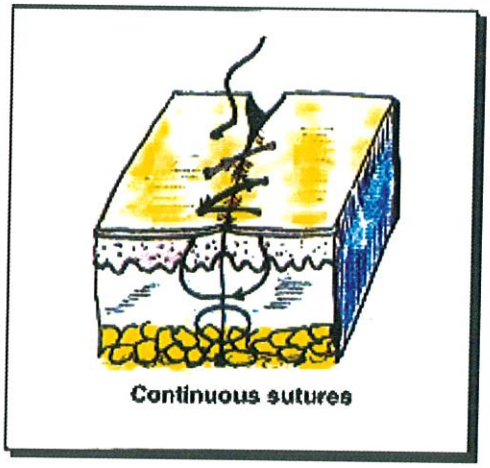
# TYPES OF SKIN CLOUSRE



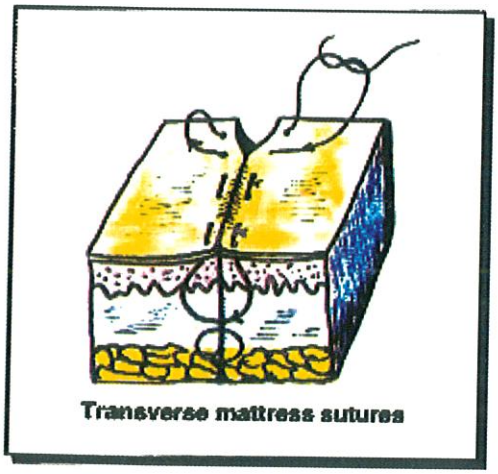
Simple sutures



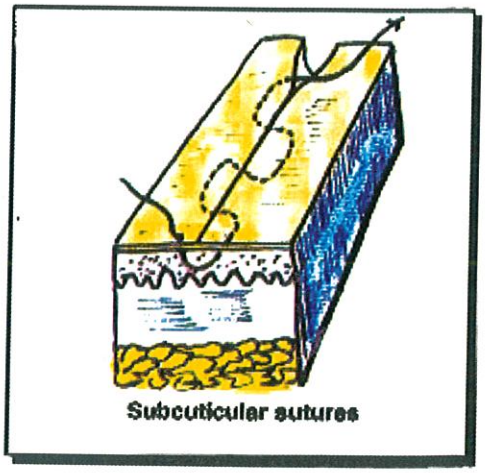
Vertical mattress sutures



Continuous sutures



Transverse mattress sutures



Subcuticular sutures

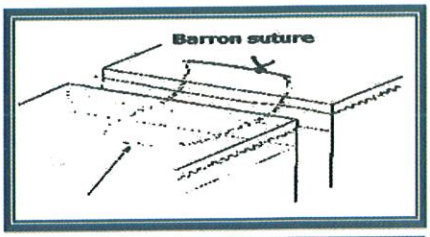
**d. Continuous suture.** Rarely used in modern practice.

**e. Subcuticular suture:**

- Excellent way of closing skin with reduced tissue pressure & ischemia.
- It may be done using either non absorbable or absorbable sutures materials.

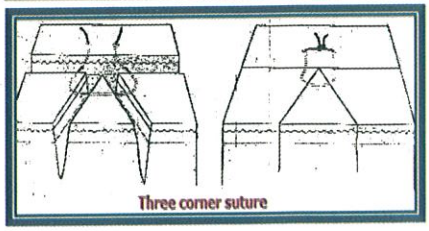
**f. Barron suture:**

- It is used when a flap of skin with a narrow or distant base needs to be secured in position.
- Have the advantages of both a horizontal mattress & subcuticular suture.




**g. Three-corner suture**

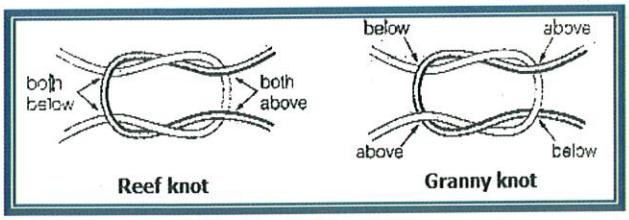
- It is a combination of horizontal mattress and subcuticular suture.
- Used in stellate lacerations where three or more arms of the laceration come together.

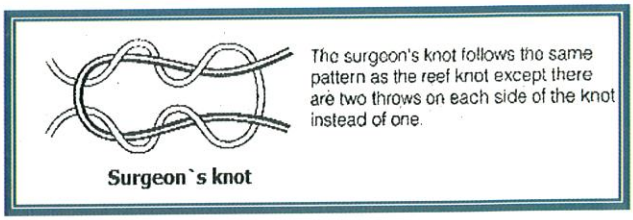



## IV. Surgical knot tying

➢ **Types of surgical knots:**

- **A reef knot**
  - It is the basic pattern from which all surgical knots derive.
  - The basic element of the reef knot is a half-hitch.
- **A granny knot**
- **Surgeon *`s knot***





The surgeon's knot follows the same pattern as the reef knot except there are two throws on each side of the knot instead of one.
Surgeon`s knot

➢ **Techniques of knot tying**

1. Instrument tied. 2. One-handed technique. 3. Two handed technique.

To ensure correct orientation of good security of the knot the ends of the thread should be pulled at 180 degrees to each other.

## V. Hemostasis & Diathermy

➢ **Prevention of bleeding:**

1. **Pre-operative strategies.**
   - Coagulopathy should be detected and corrected.
   - Aspirin should be ceased at least one weak prior to operating and warfarin approximately 4-5 days prior
   - If anti-coagulation is necessary for the patient, heparin is used in the pre-operative period.
   - Local Hemorrhage may be reduced by the use of a pre-incision injection of vasoconstrictors or tourniquets.
2. **Intra-operative strategies**
   - Any bleeding vessels are grasped &diathermized or ligated.
   - Only curved artery forceps should be used.
   - For small vessels a twist of the artery forceps is often enough to seal the vessels.
   - If a tie is not adequately secured, the vessel may be over sewn or transfixed.
   - If control is not obtained and a major vessels is disrupted the best way to gain immediate control is to apply direct pressure with a pack.

- In case of capillary oozing or venous bleeding is controlled by initial pressure with a pack combined with progressive diathermy as the pack is slowly removed.
- The applications of hemostatic substances such as topical thrombin, gel-foam or hemostatic gauze may help to decrease sever resistant bleeding.

## ➢ Technical aids in handling bleeding:

### 1. Fluid infiltration

- Injection sterile saline, this raises tissue pressure & renders the tissue translucent.
- As an extra –aid, add adrenaline 1:200000 to produce local vasoconstriction.

### 2. Tourniquet

- Contraindicated in :ischemia, Venous thrombosis, injured or infected soft tissue &bony fractures
- Inflated the tourniquet quickly to 50-70mmhg above systolic BP for the upper limb and 90-100MMHG above systolic BP for the lower limb.
- It is conventional to limit continuous inflation to **1 hour** for the arm & **1 ½ hour** for the leg &to release tourniquet for 30 minute before re-inflating it.
- At the end of the procedure release the tourniquet so you can ensure that all the blood vessels are sealed, before you close the wound.

### 3. Diathermy

- **Def:** This is a high-frequency, high-voltage, low-amperage alternating currents passed through the tissues.
- **Idea:**

***Mono-polar diathermy***:

- Employs two electrodes placed at a distance from each other.
- Current passes between a large electrode making good contact with the skin and a small active electrode where the heating effect is concentrated.
- If the alternating current is continuous, tissue disruption at the active electrode has an effect that is similar to cutting but with some coagulation of blood vessels.
- **Precautions during use: Beware** of using diathermy after applying alcoholic skin preparations and in presence of inflammable anesthetic or bowel gas.
  **Beware** of using diathermy current on a patient who has a cardiac pacemaker.
  **Do not** leave the diathermy forceps or needle lying on the patient.

***Bi -polar diathermy***

- It is safer than mono-polar diathermy.
- The current passes only between the tips of forceps in which the tissue is grasped & coagulated.
- Bi-polar diathermy cannot be used for cutting.

**4. LASER:** causes vaporization of tissues &the heating associated with vaporization produce tissue destruction with coagulation of the small blood vessels.

### 5. Ultrasound:

- If a vessel up to 2mm diameter is gently compressed and low-power U/S is applied,It reliably welds and occludes the lumen.
- At high power U/S has a disruptive cutting effect and coagulates the vessels.

**NB: Intra-cavitary bleeding**

- When there is bleeding from an unknown source into a closed cavity, delay opening it until you have everything you need to deal with the problem . As soon as you release the pressure, bleeding will start with renewed vigor.
- In the abdomen, open it rapidly &extensively and insert packs into each quadrant, then pack the central area.
- When you have stopped the bleeding, don't close up wait while the anaesthist restores the blood pressure and improves the patient's general condition.

## VI. Handling Drains

**1. Indications:** When there is something to be drained (or at least expected) e.g. pus, or uncontrolled oozing of blood

**2. Caution**

- Use the softest and least irritant materials, ensure the drain does not press on damaged, delicate or vital structure or suture lines.
- The golden rule is to put the drain near but *not* on the suture line.
- If possible, bring the drain to the surface through a separate wound rather than the main wound.
- When possible make the track lead outwards and downwards to benefit from gravity drainage.
- If you are using suction drainage, put the drain tip at the lowest point, where the fluid is likely to collect.

**3. Types of drains**

**A. Packs and wicks :Uses:**

- Wide area of raw surface where discharge is expected to occur as in abscess cavity, initial treatment for an infected wound.
- Gauze soaks up fluid most effectively if it is dry but some surgeons prefer it moistened with sterile isotonic saline solution or antiseptic solution.
- Wicks are used when the source of discharge cannot be brought to the surface.
- A wink of folded gauze is effective only until the gauze is soaked.

**B. Sheet drains**

- A trach may be kept open by inserting a sheet of latex rubber or plastic material which is often corrugated to create space.
- Although sheet drains are **not** very effective, they are popular for the drainage of abscess cavities and to provide a track for any subsequent discharge,

**C. Tube drains** either open or closed suction drains.

**4. Benefits of drains** 1. Remove harmful fluids 2. Monitor complications 3. Do little harm.

**5. Complication of drains:** A. Leakage B. Infection C. Bleeding.

**6. Removal of the drain:** When the drainage is minimal.
When drains have been removed, subsequent collections sometimes emerge from the track.

**NB:** In practice the commonest drain used in drainage of an abscess is a piece of gauze soaked with antiseptic solution e.g. betaden.

### Important general rules regarding basic surgical technique

(1) Lighting the operative field:
A bright, concentrated light should illuminate all parts of the operative field esp. the area where tissue is being manipulated.
Headlights or lighted retractor can be used for working in deep cavities.
(2) Resting tremors can be minimized by steading the instruments & hands against a firm base.
(3) In a time of a doubt or stress the basic principles should be strictly adhered to.
(4) Tension in the wound: Tension is the arch-enemy of surgical healing.

# PREOPERATIVE ASSESSMENT AND PREMEDICATION

## Goals

1. Evaluation of patient's general health
2. Optimization of general condition.
3. Choosing and planning safe anesthetic management.
4. Anticipation of complications and planning to avoid them.

## History and examination

1. **Identification of the patient:**
   - Name, age, weight. - Scheduled operation (site, side and informed consent).
2. **Concurrent medical diseases: e.g.** Cardiovascular.
3. **Concurrent medical diseases: e.g.** Antihypertensive dugs.
4. **Previous exposure to anesthesia:** History of adverse reaction or history of anesthesia-related problems e.g. succinylcholine apnea of malignant hyperthermia.
5. **Dentition:** Loose teeth should be noted.
   - Artificial teeth or denture should be removed before sending patients to operating room.
6. **The Airway:**Examine for features indicating possible difficult intubation.

## Special investigations

- Complete blood count and Coagulation profile.
- Basic chemistry.
  - Blood glucose. - Serum electrolytes.
- Renal functions and Liver functions.
- 12-lead ECG and chest X-ray for patients above 40 years.
- Specialized tests e.g. pulmonary function test for those with pulmonary disease.

## Premedications

(1) **Psychological Preparation:**

The following should be explained to patients before surgery:

- Planned anesthetic technique and its safety.
- Magnitude of postoperative pain and methods of pain relief.

(2) **Pharmacological premedication:** ***Goals of pharmacologic premedication***

- Relief of anxiety, analgesia (Benzodiazepines).
- Prevention of autonomic reflex response (Midazolam or Diazepam).
- Facilitation of smooth induction of anesthesia (Opioids).
- Anti-cholinergics (Hyoscine).

(3) **Preoperative fasting:**

Patients undergoing elective surgery should be instructed to stop oral intake for a minimum of 6-8 hours prior to surgery.

***NB:*** *In special cases we need special preoperative preparations e.g. toxic patient or jaundiced patient.*

# TREATMENT OF OBLIQUE INGUINAL HERNIA

**[A] Truss:** Better avoided, indicated only in unfit patient with reducible hernia. Even in those, some surgeons advise to leave them without truss for fear of complications of truss.

**[B] Operation:** Is the standard treatment.

***These are the days of hernial surgery without recurrence.***

- The operation is done either open or laparoscopic:
  1. **Open:**
     a. Inguinal approach:
     b. Pro-peritoneal approach.
  2. **Laparoscopic repair:** Is either:
     a. Trans-abdominal trans-peritoneal inguinal hernia repair (standard technique)
     b. Totally extra-peritoneal inguinal hernia repair.

## 1. Herniotomy:

### Indication

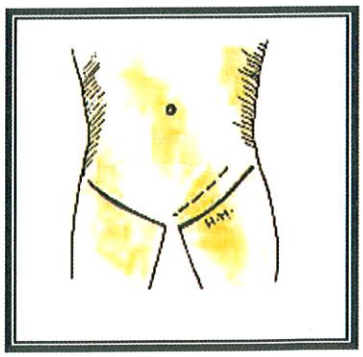
The sac is removed as far as the neck.

This operation is adequate in young patient of good musculature (in young children, herniotomy is done without opening the external oblique as the 2 inguinal rings are opposite each other).

### Pre-operative preparation

1. **Treatment of any predisposing factors.**
2. **In huge hernias:**
   - The patient lies in bed with the foot of bed raised for several days before operation to reduce the size of the hernia & allow the peritoneal cavity to accommodate the contents.
   - Artificial pneumoperitoneum may be used preoperatively in severe cases.

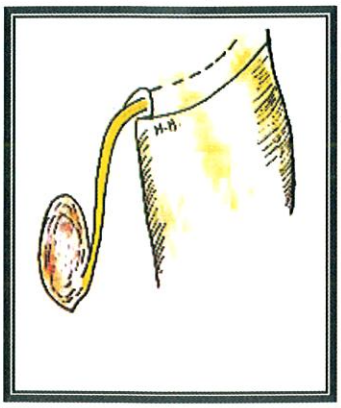
➢ **Position:** supine



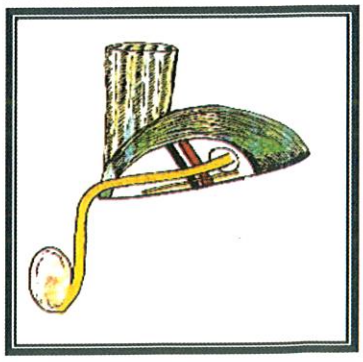
➢ **Anaesthesia:** General, spinal or local (adults).

➢ **Incision:** Half an inch above and parallel to medial 2/3 of inguinal ligament. In large irreducible hernia, the incision is extended to upper part of scrotum.

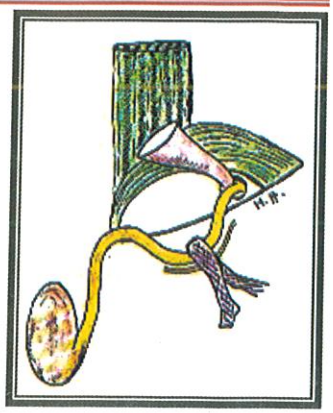
- Opening of superficial fascia (fatty & membranous layers).

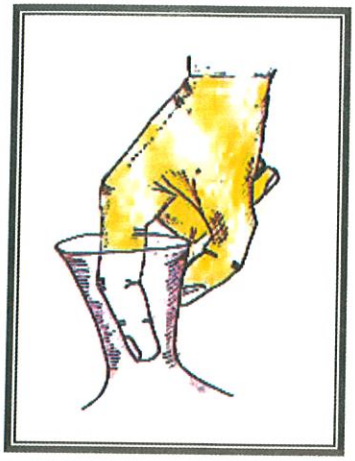


- **External oblique aponeurosis** is incised in the line of its fibers to open inguinal canal.
- The ilio-inguinal nerve is protected.

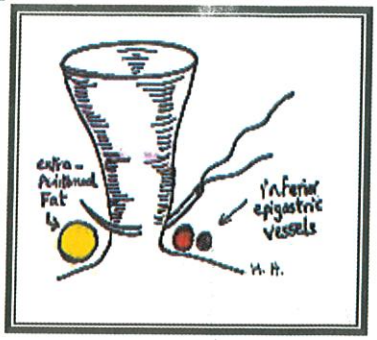


- The cord is hooked over a piece of gauze or a ring forceps.
- The sac is dissected from the cord.
  - It is known by its pearly white colour, anterolateral to vas and vessels. Dissection of the sac is continued up to the neck.
- **The neck is identified by:**
  (1) The narrowest part of the sac.
  (2) The extra peritoneal fat is condensated around it.
  (3) The adjacent inferior epigastric vessels at the medial side of the neck.





- The sac is opened and explored, a finger is passed through the mouth of the sac exploring for concomitant direct inguinal hernia.
- The neck of the sac is transfixed and ligated as high as possible & the sac is excised half an inch distal to the ligature .

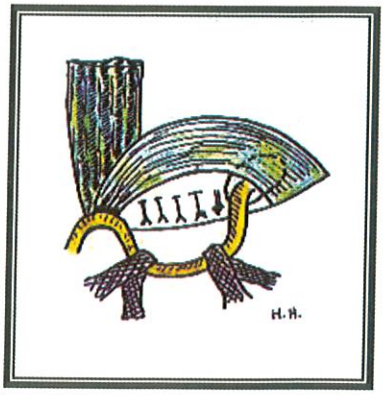



## 2. Inguinal herniorrhapy:

**One of the following types of repair is used:**

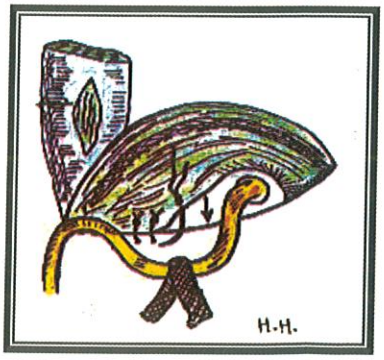
### [1] Plication of Transversalis Fascia: (Lytle's Repair)

- The transversalis fascia is plicated by few interrupted non-absorbable sutures.
- The deep inguinal ring is narrowed to the size of the tip of little finger with displacing the cord laterally as much as possible.



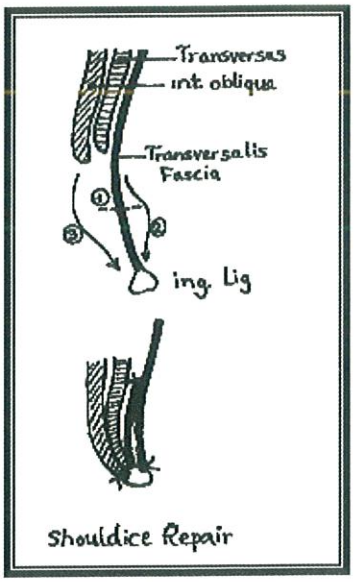

### [2] Bassini's Repair (1887):

- The conjoined tendon is sutured to the inguinal ligament behind the spermatic cord.
- **Disadvantages:**
  It interferes with shutter mechanism and union is weak between fleshy fibers and a ligament.
- **In Bassini repair:**
  1. Care is taken not to puncture the external iliac vessels.
  2. The most medial stitch must pass through the conjoint tendon and the periosteum of the pubic tubercle.
  3. The most lateral stitch should allow the tip of the little finger beside the spermatic cord.



### [3] Tanner's Slide Modification:

- In Bassini repair, if approximation of the conjoined tendon and inguinal ligament will be under tension, a relaxing incision in the rectus sheath will prevent this tension.

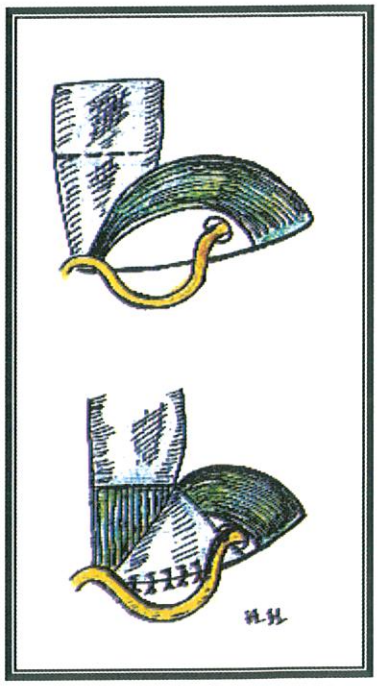



### [4] Mc Vay repair: (Cooper's ligament repair)

- Suturing :
  - The fascia transversalis & lower border of conjoint tendon
  - Medially to the pectineal ligament **(Cooper's ligament)** &
  - Laterally to **ilio-pubic tract**.
- It may require a Tanner's release incision.
- It is effective in the repair of inguinal hernia associated with femoral hernia.

### [5] Shouldice (Toronto) repair:

- The internal ring & fascia transversalis are incised & carefully separated from the deep inferior epigastric vessels before overlapping repair of the lower flap behind the upper flap (Double breasting technique).
- Finally, the conjoined tendon is sutured to the inguinal ligament behind the spermatic cord.



## *Other types of repair of inguinal hernias (not used nowadays):*

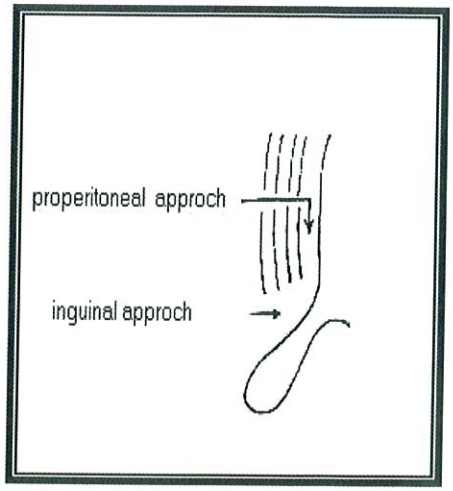
1. **BloodGood's Repair:**
   - A triangle of the anterior rectus sheath is turned laterally hinged on the lateral border of the sheath and is sutured to the inguinal ligament behind the cord.
2. **Halsted's repair:**
   - Anterior transposition of the cord with repair of the ext. oblique aponeurosis behind the cord which is left S.C.
   - Disadvantage:
     The inguinal canal is no longer oblique with loss of valvular mechanism.
3. **Andrew's repair:** (not used nowadays)
   - Conjoined tendon & Med. edge of ext. oblique are sutured to inguinal lig.
   - Then lat. flap of ext. oblique aponeurosis is sutured over the cord.
4. **Fergnson's repair:**
   - Putting the cord below the repair **(Modified Bassini).**
5. **Zimmerman's repair:**
   - Suturing at the edge of ext. oblique (below the cord) to fascia transversalis to int. oblique.
6. **Koontz repair:**
   - Excision of cord and obliteration of int. ring.

## 3. Hernioplasty:

The standard treatment nowadays of inguinal hernia repair in adults is tension free repair using mesh.

***Defective tissue ratio between type I collagen& type 3 collagen against the use of the defective collagen for repair.***

**"Lichtenstein tension free hernioplasty"** has been adopted by the majority of surgeons.




(**a**) The idea that one mesh can serve all purposes is wrong.

(**b**) There are **3** major synthetic meshes:

- **Poly-propylene mesh.**
- **Poly-ester mesh.**
- **Poly-tetra-fluro-ethylene mesh.**

(**c**) **Expanded PTFE mesh** can be used safely intraperitoneally.

(**d**) **Ventralax patch** is a composite mesh made of PTFE disc on the side that placed towards the visceral side in the abdomen & a smaller PPM disc on the other side. It is used for the majority of the epigastric & umbilical hernias.

(**e**) **Biological mesh** recently is used in contaminated situation.

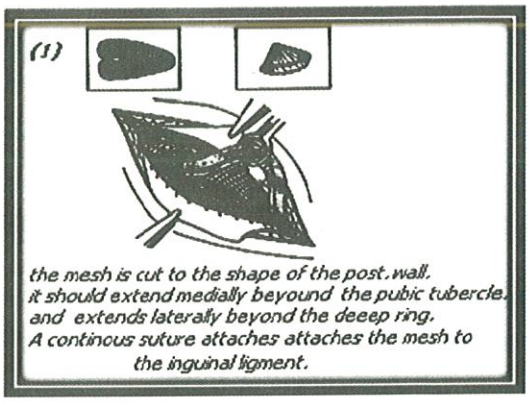
**N.B.**

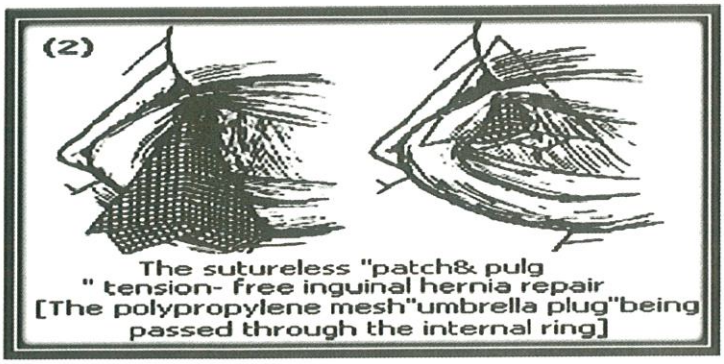
1. It is not suitable in some strangulated hernias as there is a high risk of infection
2. Nonfixation of the mesh may result in folding & wadding of it ***(meshoma)***.
3. Mesh that is completely flat with no laxity in a patient under sedation will be subject to tension when the patient strains or in standing position.
4. Prophylactic antibiotics should be administered when,
   - A prosthetic mesh will be used for the repair
   - Infection is high.

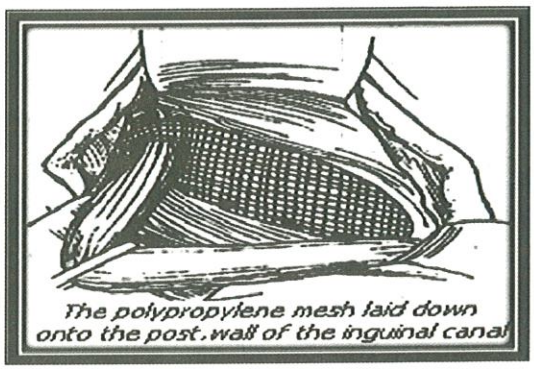
### ⌦ *Other old types of hernioplasty*

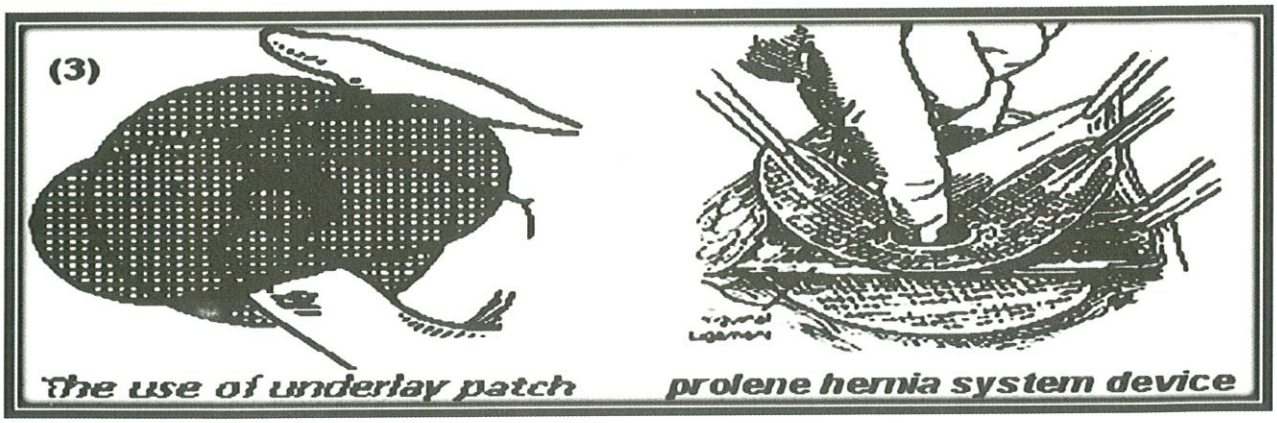
1. **Darning with fascia lata:**
   Long strip of fascia lata is threaded over Gallie's needle and darning starts from the pubic tubercle to the internal inguinal ring.
2. **Fascial patch graft from fascia lata.**
3. **Mair's skin graft:**
   Its lateral end is split to enclose the cord. Its margins are sutured to the inguinal ligament and conjoined tendon. The graft is stretched like a drum
   (This leads to atrophy of epithelial elements of the graft and prevents the development of implantation dermoid cysts).

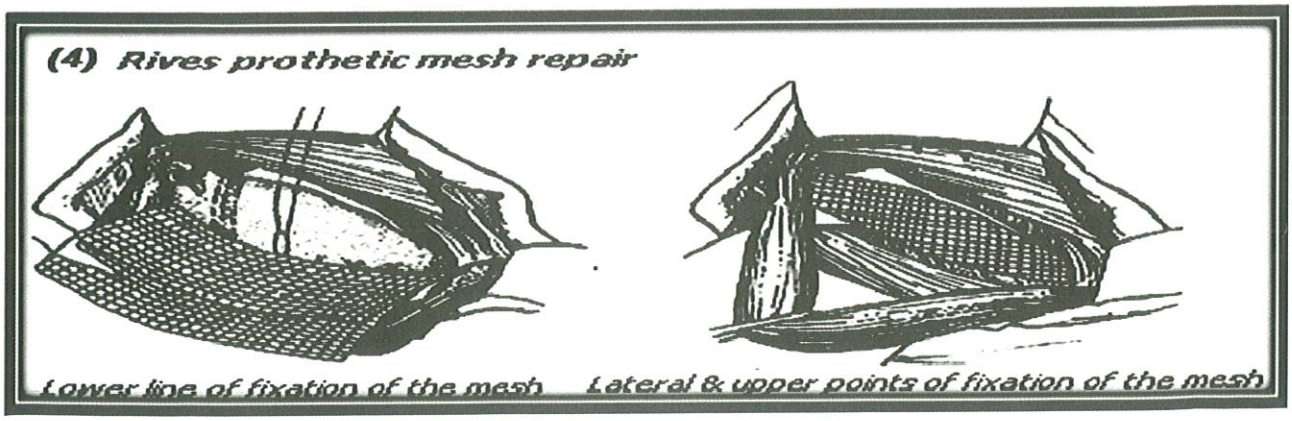
# Different methods of using mesh in hernia repair


(1)
the mesh is cut to the shape of the post. wall.
it should extend medially beyound the pubic tubercle.
and extends laterally beyond the deeep ring.
A continous suture attaches attaches the mesh to
the inguinal ligment.


(2)
The sutureless "patch& pulg
" tension- free inguinal hernia repair
[The polypropylene mesh"umbrella plug"being
passed through the internal ring]



**The properitioneal approach exposes the groin from between the transveralis fascia and peritoneum through a low abdominal incision (and not through the inguinal canal). The defect in fascia transveralis is closed.**

## Stoppa operation: *An example for open propertoneal approach*

- It describes the **giant prosthetic reinforcement of the visceral sac** (**GPRVS**).
- Behind the endoabdominal fascia the cleavage spaces of **Retzius** and **Bogros** spread widely medially & laterally on both sides.
- These spaces are a useful surgical route to reach deep hernia defects.
- They are perfect site for placement of the giant prosthesis.
- A **large non absorbable prosthetic mesh** is inserted through a preperitoneal approach covering both inguinal regions.
- It is mainly indicated in groin hernias in adult with high risk of recurrence.

## Post operative complication

1. **Haematoma.**
2. **Infection.** from the pubic tubercle
3. **Hydrocele.**
4. **Recurrence** ***:due to***
   (a) Preoperative causes:
      1. General factors: old age, obesity, cough, constipation and urinary obstruction.
      2. Local causes: poor musculature, large hernia, previous recurrence.
   (b) Operative:
      1. Incomplete removal of the sac = **Transfixation not at the proper neck.**
      2. Missing a second sac.
      3. Inadequate repair.
      4. **Tight suturing** in the repair devitalizes tissues.
   (c) Post operative:
      1. Haematoma 2. Infection 3. Post operative straining 4. Hurried convalescence.
5. **Chronic inguinodynia:**
   a) **Ilio-inguinal nerve** is at risk along its entire course in the groin.
   b) **Genital nerve** is at risk medial to the internal ring.
   c) **Inguinal nerve** is at risk lateral to the internal ring & in the preperitoneal space.

***N.B.:***

- These 3 nerves may share interconnecting fibers, so identification of the entrapped nerves may be difficult.
- **Paravertebral block at L1,2** helps to distinguish the specific nerves.
- S.C. injection of the inguinal region with 5% bupivacacine HCL will transiently relieve the pain.
- Non surgical treatment includes **radio-frequancy destruction** & Drugs as **Gapapentin** & analgesics.

# TREATMENT OF DIRECT INGUINAL HERNIA

**[A] Palliative:** Small hernias in elderly people may be treated by truss.

*Even in unfit patients many surgeons don't recommend truss for its complications.*

**[B] Surgical:** For large hernia, young patient or narrow neck.

- **Treat any predisposing factors.**
- **Operation:**

## 1. Herniotomy:

*Differs from that for indirect hernia in:*

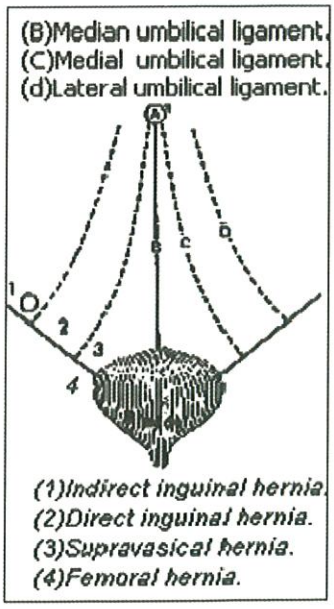
1. The sac lies behind the cord and does not pass within its coverings.
2. The sac is always medical to inferior epigastric vessels.
3. The neck of the sac is wide so transfixation can not be done therefore the neck is closed by continuous sutures.
4. The sac may not be excised and just invaginated by sutures (preferred by many surgeons).

## 2. Herniorrhaphy or hernioplasty:

Are essential to strengthen the posterior wall of inguinal canal (see before).

**N.B:**

- There are **4** types of groin hernias.
  - Direct.
  - Indirect.
  - Supravasical.
  - Femoral.
- **Supravasical hernia** is a form of direct hernia occupying the medial part of Hasselbach triangle




*(1)Indirect inguinal hernia.*
*(2)Direct inguinal hernia.*
*(3)Supravasical hernia.*
*(4)Femoral hernia.*

# TREATMENT OF SLIDING HERNIA

- ***On the right side:*** Caecum & appendix.
- ***On the left side:*** Sigmoid colon.
- ***On both sides:*** Urinary bladder.

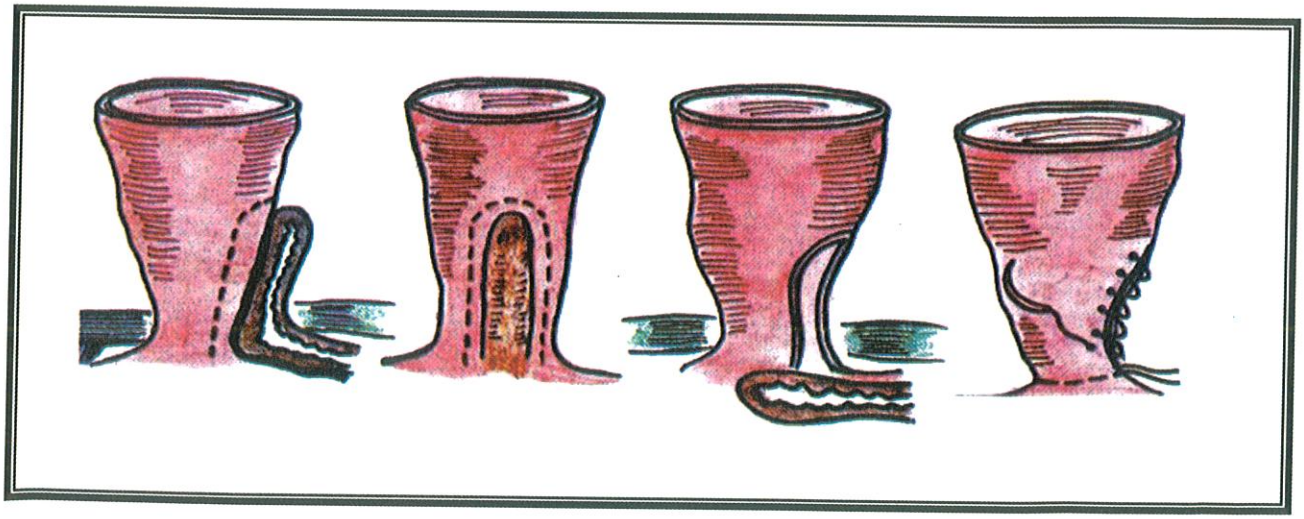
**NB: In inguinal hernias of female (Hernia of a canal of Nuck) a sliding tubes & ovaries are common.**

## General guide lines:

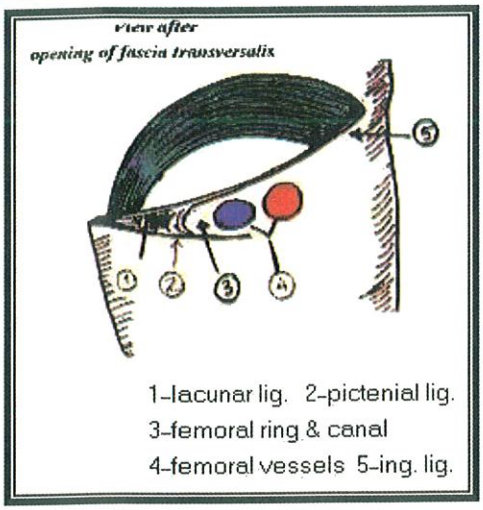
1. No attempt should be made to separate the cecum or sigmoid from the sac. This may compromise the blood supply.
2. Appendix must **not** be removed as this may intrudes sepsis..
3. Appendisis epiploice must **never** be removed from the sigmoid as thy may harber a small chronic diverticule.

## Options of treatment:

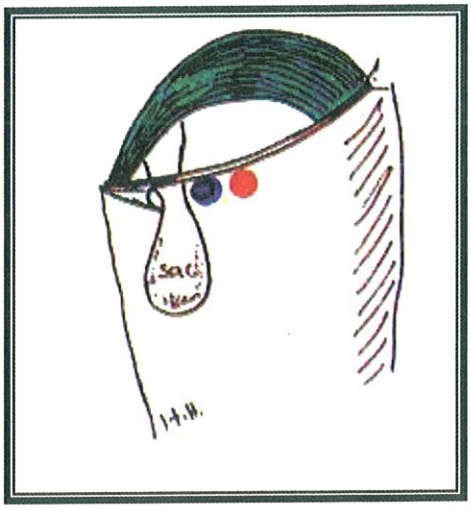
1. A U-shaped incision is made in the peritoneum at a distance of about 2 cm from the bowel.
   The gap in the posterior wall of the sac is closed by suture.
   The bowel is replaced now within the abdominal cavity.
   The neck of the sac is closed by a purse string suture.
2. High transfixion above the sliding organ & invagination of the sac.
3. If the associated sac is small there is **no** necessity to remove the sac. It is simply invaginated intraperitoneally & the repair is done.



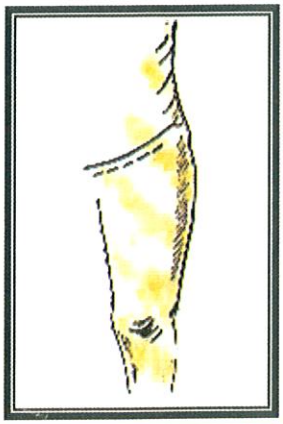
# TREATMENT OF FEMORAL HERNIA




1-lacunar lig. 2-pictenial lig.
3-femoral ring & canal
4-femoral vessels 5-ing. lig.



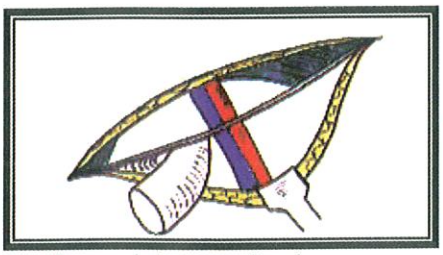

**1. <u>Truss</u>** is unsatisfactory;
As it is displaced on flexion of the thigh and the high risk of strangulation in femoral hernia.



**2. <u>Operative treatment:</u>**
[I] Low approach.
[II] High approach.
[III] Combined approach.

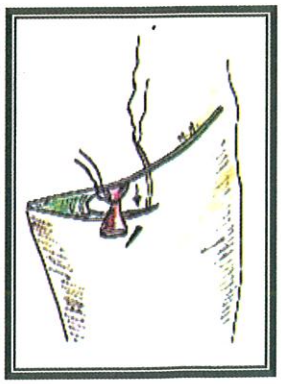
## [I] Low Approach (lock wood) :

- Sac is exposed in the thigh by an incision below the inguinal ligament.



- The neck is dissected high up behind the inguinal ligament.

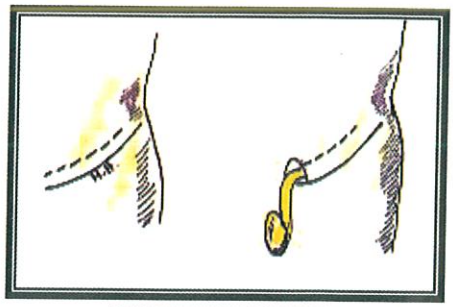
**N.B.:**
When the neck of the sac is constricted by tight femoral ring the ring can be dilated by finger or by an incision medially into the lacunar ligament.



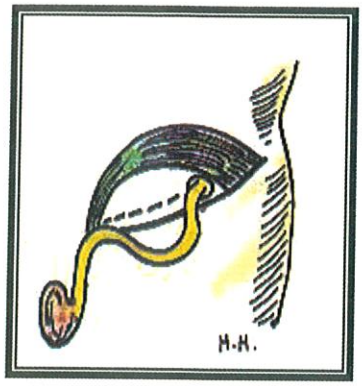
- The neck is transfixed.
- Repair is done by suturing the *<u>Poupart's</u>* ligament (inguinal ligament) to *<u>pectineal</u>* ligament **(P. to P.).**
- **<u>Disadvantages:</u>**
  1. The sac can not be excised to the proper neck, so recurrence may occur.
  2. Strangulated bowel is not dealt with.
  3. Associated inguinal hernia is not dealt with.
  4. Injury to an abnormal obturator artery is common.
- **<u>Abnormal obturator artery:</u>**
  <u>In 30% of cases,</u> the pubic branch of the inferior epigastric artery is very large, taking the place of the obturator artery, and being known as the abnormal obturator artery.

  <u>In 10% of cases,</u> the vessel passes down along the edge of the lacunar ligament which is the inner boundary of the femoral ring (dangerous position).

## [II] High approach (Lotheissen's operation):



- The inguinal canal is opened as for inguinal herniorrhaphy.



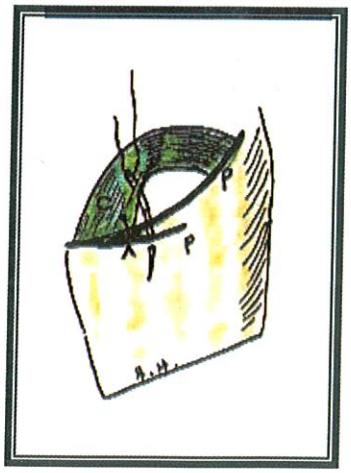

- Then the transversalis fascia is incised to the medial side of epigastric vessels.
- This exposes the peritoneum.

- The femoral sac is dissected from above and pulled from the thigh upwards

- Sac is ligated and cut.
- Repair is then done by either,
  - The conjoined tendon is sutured to Pectineal ligament **(C. to P.)**

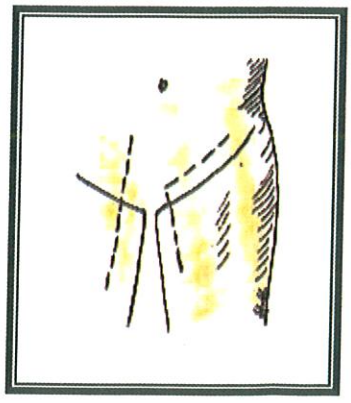
Or

  - Poupart's ligament to conjoined tendon to pectineal ligament **(P. to C. to P.)**.



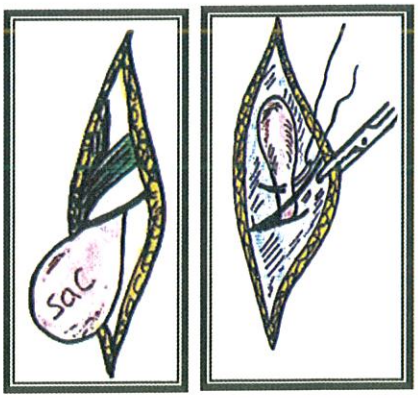

- **Advantages:** The reverse of disadvantages of [I] Low approach.

## [III] Combined approach (Mc Evedy approach):



- **Incision:**
  A vertical incision is made over the femoral hernia and continued above over the inguinal ligament.
- Through the lower part of the incision, the sac is dissected out

- The upper part of the incision is deepened parallel to the lateral border of the rectus muscle till the extra-peritoneal space is reached & the neck of the sac is identified.
- The fundus of the sac pushed behind the inguinal ligament.
- Transfixation excision is done at the femoral ring.
- **Advantages:**
  1. Easy resection anastomosis.
  2. No disturbance of inguinal Canal or Shutter mechanism.
  3. Excision at the proper neck.



**NB:**
**Some author preferred to patch the femoral canal by mesh to cover the femoral canal from within and Overlap its edges. It is sutured to the inguinal &the pectineal ligament. The mesh is then covered with a flap of pectineal fascia.**

# TREATMENT OF PARAUMBILICAL HERNIA

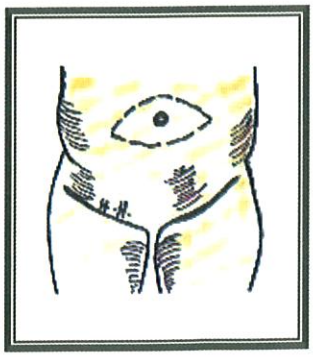
## Pre-operative preparation

1. Treatment of any predisposing factors.
2. Weight reduction.
3. Control of DM, hypertension ... etc.

**I. Truss:** Is not satisfactory.

**II. Operative:**

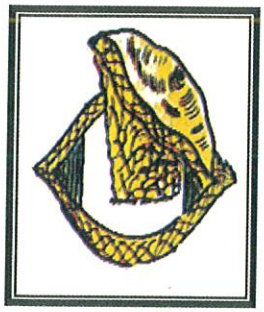
### 1. Mayo's repair:



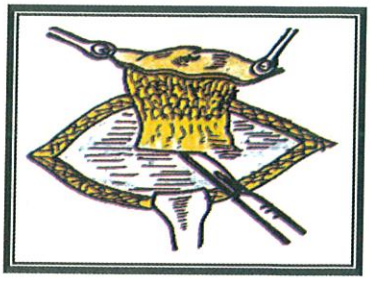
- **Indications:**
  In the past, it was the classical repair for P.U.H but it is not used nowadays because:
  a. Repair is subjected to tension when the patient bends backwards.
  b. High incidence of recurrence.
- **Anaesthesia:** General or local.
- **Position:** Supine.
- **Incision:**
  a) Transverse elliptical incision enclosing the umbilicus.
  b) Transverse incision over the hernia just above the umbilicus but in sometimes, you can make an elliptical incision to remove the redundant skin.

**N.B.:**
The umbilicus is a potentially infected site & antibiotic cover should be considered in all repairs.

- The incision is deepened until linea alba and both rectus sheathes are exposed.
- Neck of the sac is exposed by dissection.



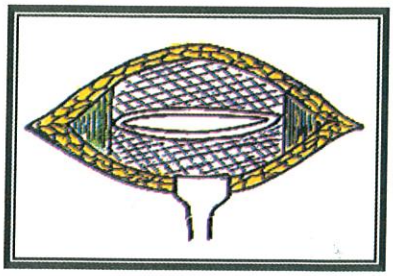
- The sac is opened at the neck to avoid adhesions at the fundus.



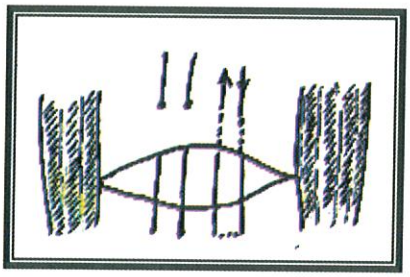
- Adherent intestine is dissected and reduced but adherent omentum is excised.

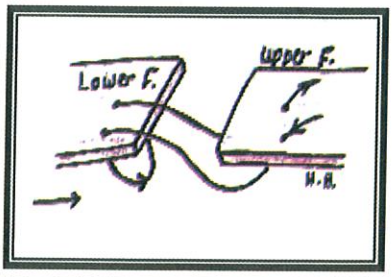
**N.B.:** Not infrequently, these herniae consist of 2 adjacent defects with a narrow intervening strip of intact linea alba. This should be divided to create one defect before repair.

- Widening of the defect till medial edge of recti.

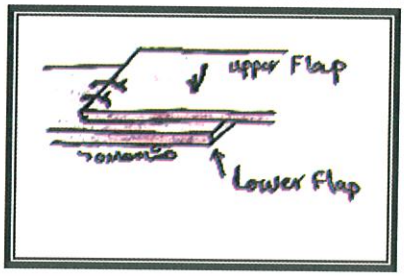


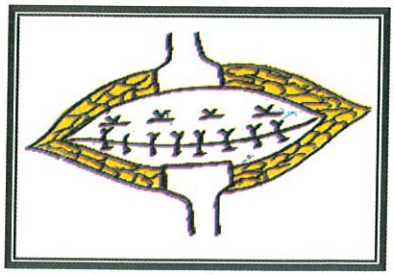
- The lower flap formed by the rectus sheath and peritoneum is drawn undercover of the upper flap by mattress sutures.






- The free edge of the upper flap is sutured to anterior rectus sheath.



- Reconstruction of a new umbilicus (not routine).
- Skin is closed with a drain in subcutaneous tissue.

**2. Anatomical repair:** Simple closure of the defect by interrupted prolene sutures.

**3. Hernioplasty:** Using synthetic prolene mesh.

- **It is the standard treatment nowadays** as repair of paraumbilical hernia without mesh carries high incidence of recurrence.
- Anatomical repair is only justified in repair of umbilical hernia in children.

# TREATMENT OF INCISIONAL HERNIA

- Palliative abdominal belt may be used.
- Pre-operative reduction of weight.

**Anaesthesia** General.

**Position** Supine.

**Technique**

1. **Elliptical incision** including the scar of previous operation.
2. **Dissection** is done till the edges of the defect in the abdominal wall and the sac are exposed.
3. **The sac** is opened at the neck (free from adhesions) & deal with the contents of hernia as usual.
4. **Repair** is done by one of the followings:

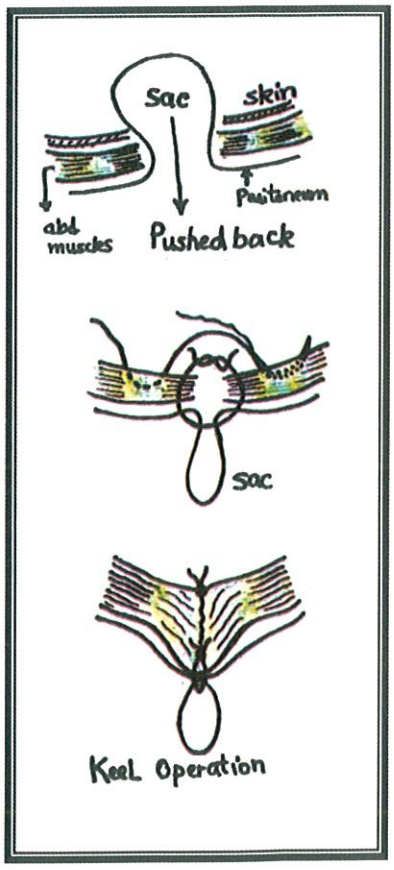
## [A] Herniorrhaphy:

1. **Anatomical repair:**
   After excision of scar tissue in small hernias, the sac is excised & the abdominal wall is closed in layers.

2. **Herniorrhaphy by Keel operation:**
   The hernial sac is not opened. It is dissected out & pushed back into the abdomen by a series of inverting layers of unabsorbable sutures, the abdominal defect is closed.
   This repair, if viewed in a cross-section, looks like *the keel of a ship.*

3. **Cattell's repair:**
   - The sac is dissected & opened & its contents are returned to the abdomen.
   - *The following layers are closed in the same sequence:*

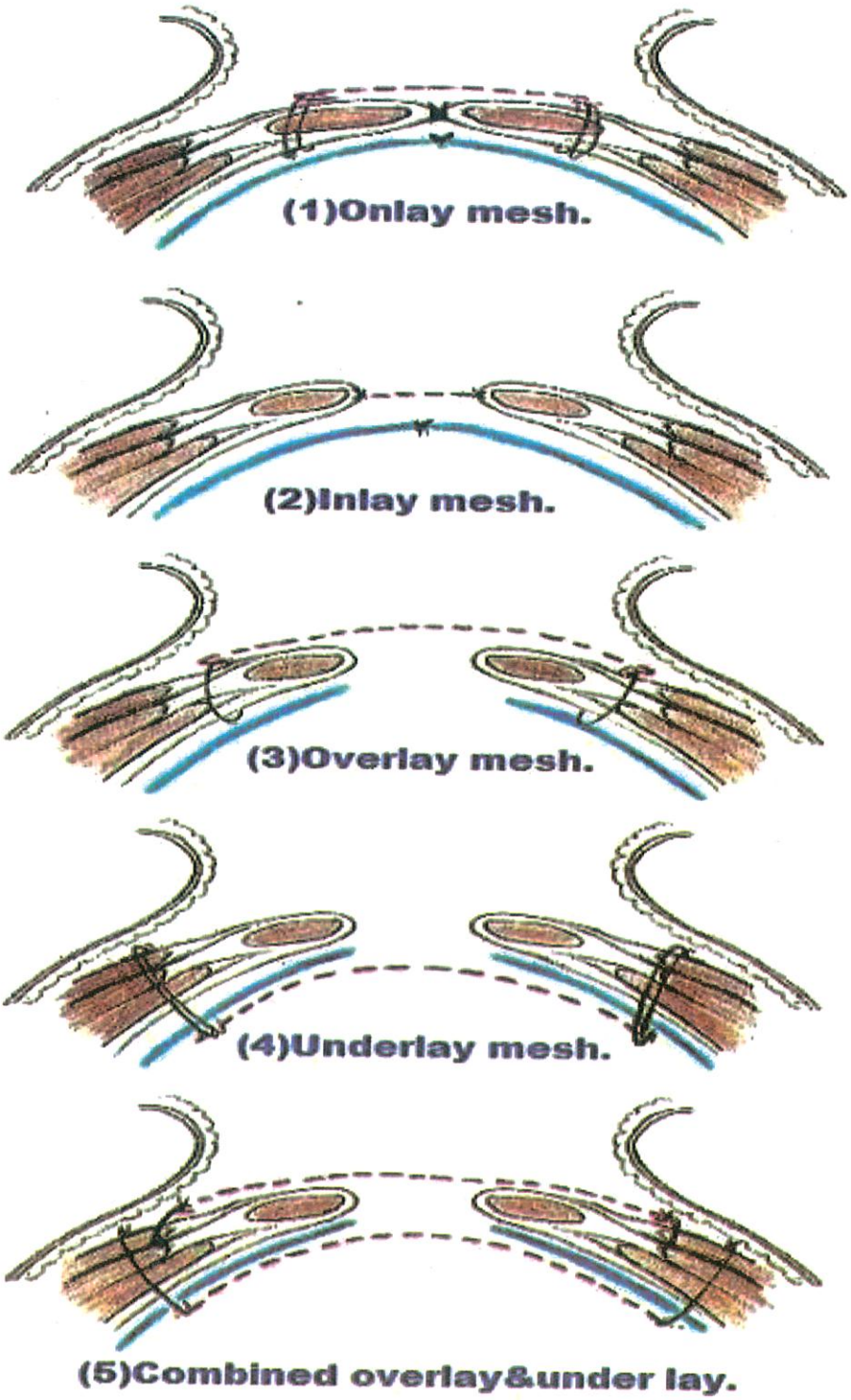
     1. The neck of the sac is closed from inside (first layer).
     2. The sac is excised & its edges are sutured as another layer (This is the second layer).
     3. The edges of the fascia (posterior rectus sheath) are freed and closed by interrupted sutures (third layer).
     4. Muscles are approximated (fourth layer).
     5. Anterior rectus sheath is then closed in front of the muscles (Fifth layer).
     6. Fat & skin are then closed (sixth layer).



**(B) Hernioplasty:** Using synthetic mesh.

- *The standard repair nowadays for the high rate of recurrence after herniorrhaphy (40-50%).*

**Examples of Different options in placment of meh in ventral hernia repair**



# TREATMENT OF VAGINAL HYDROCELE

## [I] Aspiration

- After transillumination (to localize the testis) the swelling is made tense by manual compression.
- A fine trocar and canula is inserted into a translucent area and fluid evacuated.
- This method is indicated when an operation can not be done e.g. unfit patient.
- Injection of a sclerosant after aspiration can obliterate the space & prevent recurrence, but this may cause severe pain unless mixed with a short & long acting anaesthetic agent.
- **Complications:**
  1. Recurrence. 2. Hemorrhage. 3. Infection. 4. Injury of the testis.

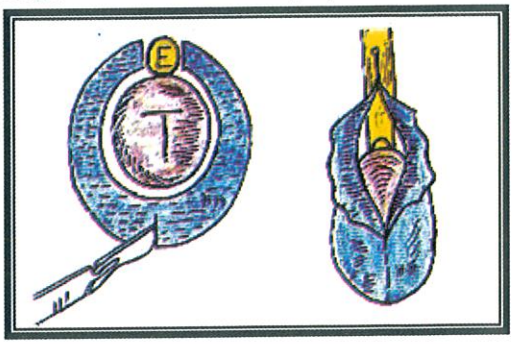
## [II] Operative Treatment

### (A) Eversion of the Tunica:

- **Anaesthesia:** General or spinal.
- **Position:** Supine.
- **Incision:**

**(a) Inguinal incision:**

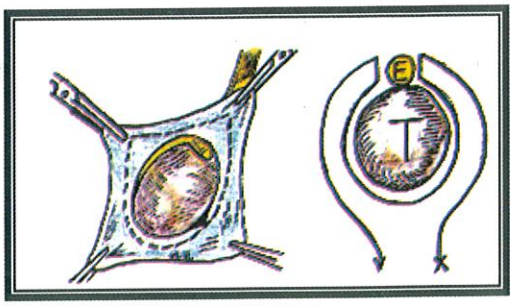
Done if the patient is being operated for hernia and hydrocele.




**(b) Scrotal incision:**

1. Anterolateral vertical incision in the scrotum.
2. Anterior transverse incision leads to less bleeding as the subcutaneous vessels lie mainly transversely.

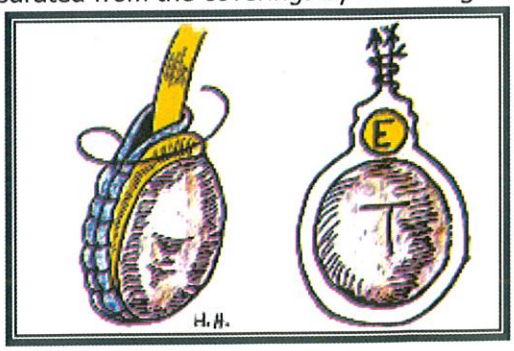
- **Steps:**
  1. The incision is carefully deepened until the hydrocele sac.




**Layers opened:**

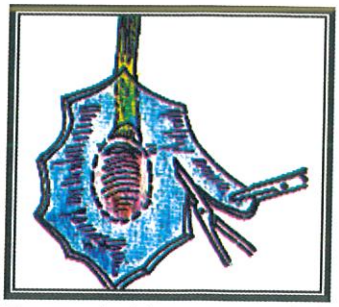
- Skin.
- Dartos muscle
- External spermatic fascia.
- Cremasteric muscle.
- Internal spermatic fascia.

  2. Hydrocele together with testis and epididymis are separated from the coverings by blunt finger dissection and delivered out.
  3. The hydrocele sac is incised and the fluid is evacuated.
  4. The sac is everted & sutured continuously behind the epididymis.
  5. Wound is closed.
  6. Scrotal bandage: Is applied for 24 hours to avoid haematoma formation.
  7. Drain is removed after 24 hours.
  8. Stitches removed on the 5th day.



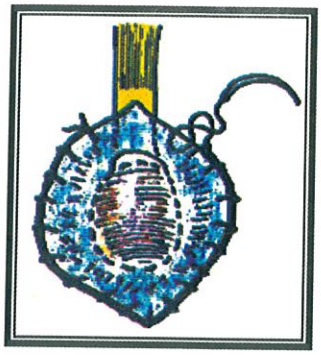

- **The aim of the operation is to bring the visceral layer of the tunica immediately under the scrotum. Thus any fluid formed will be drained by the lymphatics of the scrotum.**

## (B) Subtotal excision of the tunica:



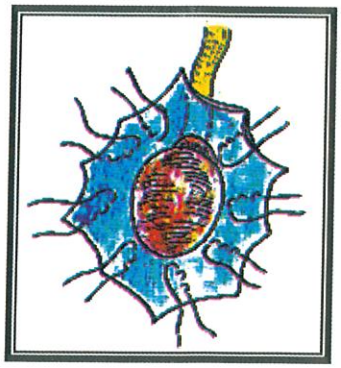
➢ **Indications:**
- Large hydrocele.
- Thickened, fibrosed & calcified sac.
- Recurrent cases and haematocele.

➢ The redundant sac is excised close to its reflection onto the epididymis.



➢ The bleeding points are secured and running continuous locking suture of the fine catgut is then inserted all round the cut margin to reduce subsequent bleeding.

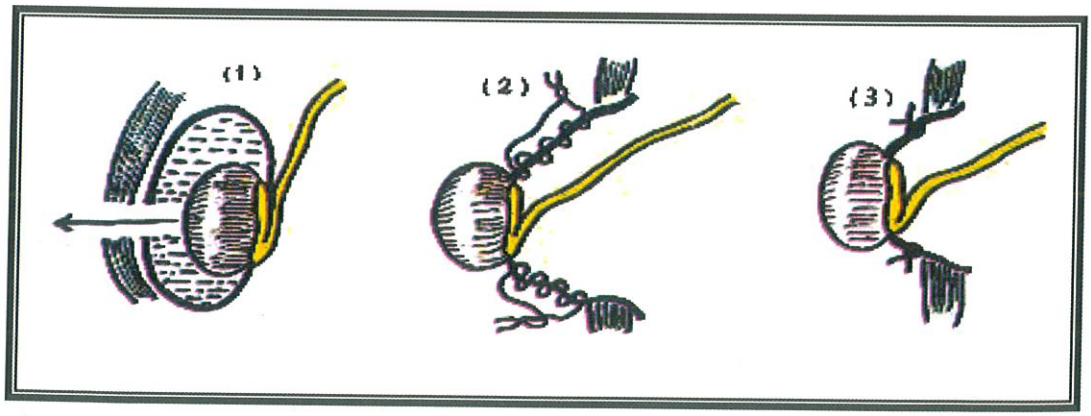
➢ This interlocking stitch has two advantages over the continuous simple stitch:
1. It is more haemostatic.
2. It does not result in a purse-string effect.



## (C) Lord's operation (For thin tunica):

➢ **Advantage:**
No tissue dissection, no post-operative edema or haematoma & no drain.

- A small incision is made through all layers, including the parietal layer of tunica.
- The testis is allowed to prolapse through the wound so that the tunica is totally everted.
- A series of 10-12 catgut sutures are taken radially from the cut edge of the tunica to the reflection of the tunica from the testis & epididymis to plicate the parietal layer of tunica vaginalis around the epididymis to prevent recurrance.
- The testis is pushed in and the wound is closed.



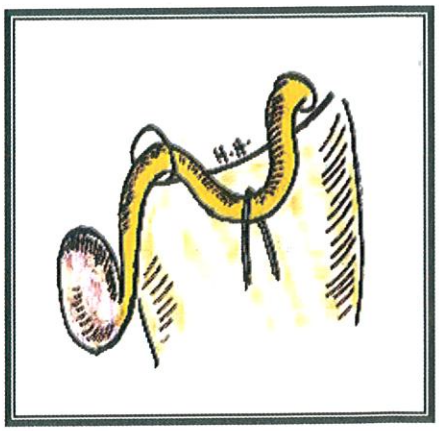
# TREATMENT OF PRIMARY VARICOCELE

## [A] Conservative treatment

*For early **un**complicated cases:*

1. Avoid any predisposing factor.
2. Regular sexual life.
3. Frequent cold bathes.
4. Scrotal suspender.

## [B] Surgical treatment



➢ **Indications:**

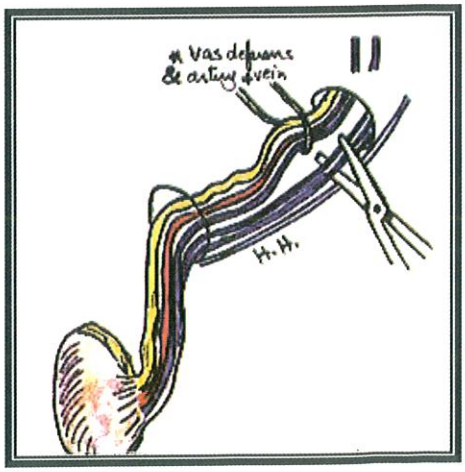
a. Large painful varicocele.
b. Serious depression of spermatogenesis (spermatogenesis).
c. Failure in medical commission.

1. **Inguinal approach.**

2. **Pelvic approach:**
   - Open.
   - Laparoscopic.
3. **Scrotal approach:**
   - Multiple ligatures (Delta operation).
   - Transfixation excision.

### 1. High ligature operation (Inguinal approach):

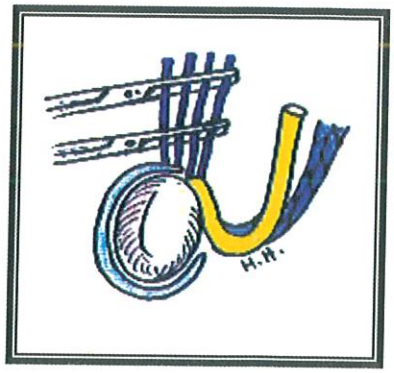
- The canal is opened & the spermatic cord is delivered.
- The vas deferens together with its artery and testicular artery are carefully separated from the main mass of dilated veins which are divided near the internal inguinal ring.
- Dilated cremasteric veins are also ligated.



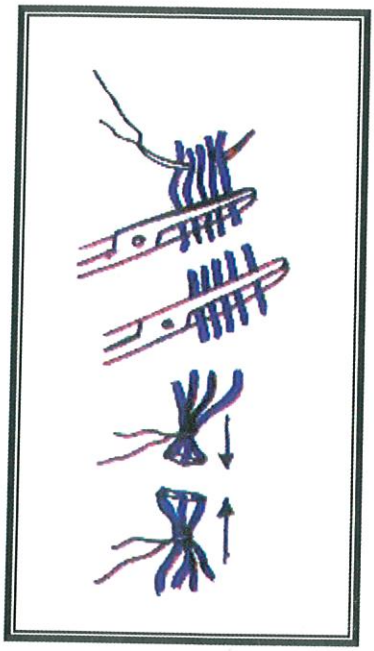

### Complications

1. Injury of testicular vessels or vas.
2. Post-operative hydrocele.
3. Recurrence due to improper technique.
4. Testicular atrophy.

## 2. Transfixation - excision:




- The cord is exposed through a scrotal incision.
- The anterior group of veins is caught by kocker's forceps separated from each other by 2 inches

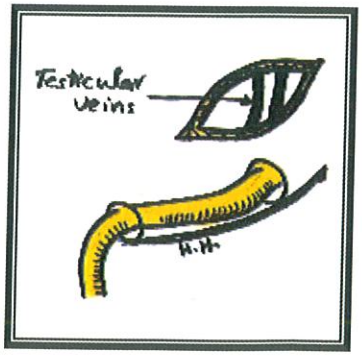


- The segment between the two forceps is excised.
- The stumps are transfixed, ligated and approximated together.
- The tunica is everted to avoid post operative hydrocele.
- **Disadvantages:** Atrophy of testis may occur.

## 3. Multiple ligature:

(Delta operation) the veins are ligated at multiple points and the tunica is everted .

## 4. Pelvic approach (Palomo's operation):




- A small oblique incision is made 3 cm above the level of the deep ring. The ring and the aponeurotic & muscular fibers are separated as in the classical **"Gridiron"** manner.
- Extra-peritoneal fat & Peritoneum are swept upwards.
- High division & ligation of testicular veins (1-2 veins) in the retro-peritoneal region as they lie in the posterior abdominal wall lateral to external iliac artery.

**Advantages**

a. Simple & effective.
b. The cremasteric vessels & vein of the vas are spared providing alternative venous return.

**N.B.: The other option in treatment of symptomatic varicoceles is a radiological procedure in which the testicular veins are embolized endoluminally.**

# CIRCUMCISION

## Indications

1) Religious/ritual.
2) Phimosis.
3) Recurrent balanitis (inflammation of the glans penis).
4) Failure to retract during sexual intercourse.
5) Prior to radiotherapy (SCC of glans penis).

## Contraindications

1) Hypospadius & epispadius (prepuce may be needed for repair).
2) Bleeding tendency.

## 1) Circumcision by crushing method:

**This is for neonates and infants:**

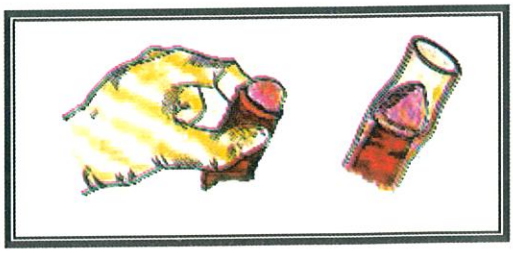
### Pre-operative preparation

- Vitamin K I.M. 12 hours before the operation if prothrombin level is low. (In babies below one month).
- Prevent erection in adults by sedatives & bromides (2 days before to 2 weeks after the operation).

### Timing

- It is recommended to do the operation on the 2nd or 3rd month of life.
- The 1st month is better avoided because of bleeding tendency in newborn.

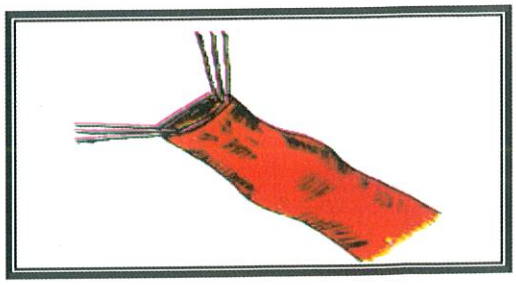
➢ **Anaesthesia:**
- Non for neonates below 40 days.
- General anaesthesia for those over 40 days.



➢ **Position:** On the back.
- The knees are held flexed, and the thighs flexed and abducted by an assistant.

➢ **Local preparation:**
- The prepuce is cleaned from smegma by cotton-wool soaked in ether.

➢ **Incision:**
The site of incision is marked on the skin of the dorsum of the penis by the scratch of a scalpel or a marker.

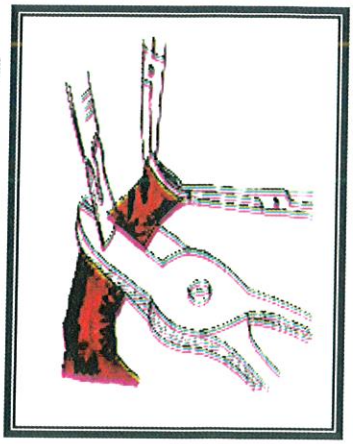


➢ **Technique:**

1. The edge of the prepuce is held at its upper and lower margins by an artery forceps and traction is applied.

2. The glans is pushed backwards behind the line chosen for incision and it is protected while the bone cutting forceps is applied over the desired line.

3. The prepuce is cut away.
4. Bleeding vessels are picked up and are either ligated or are secured in fine catgut sutures which unite the cut edges of the two layers of the prepuce.



## 2) Circumcision by dissection:

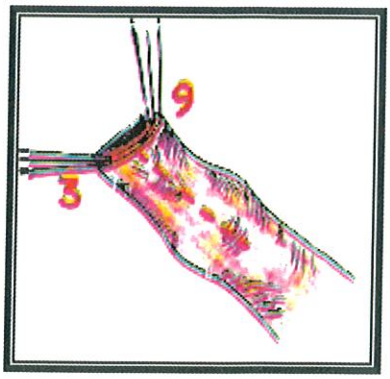
**This is for older children and adults:**

➢ **Anaesthesia:**

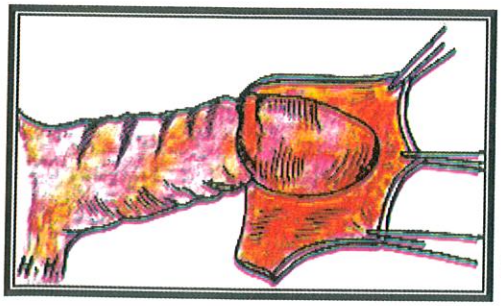
- General anaesthesia for older children.
- Local infiltration anesthesia for adults. Adrenaline must never be added to the anaesthetic solution since vasoconstriction of all penile vessels may lead to gangrene of the glans.

➢ **Position:** Supine.

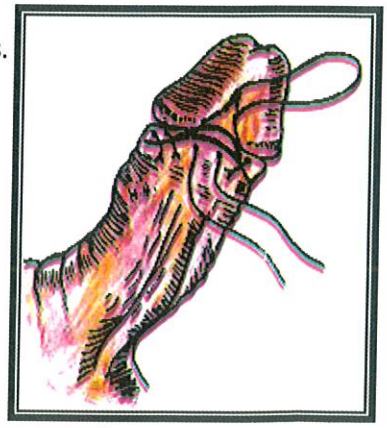
➢ **Technique:**




1. Smegma is removed.
2. The edge of the prepuce is held on either side by an artery forceps and traction is applied.
3. The prepuce is divided in its dorsal (upper) midline.



4. The prepupital skin is divided all around the circumference of the penis at a line parallel to the corona.
5. The inner layer is divided all around the circumference of the penis several millimeters from the corona.
6. Haemostasis for bleeding points.



7. Interrupted chromic catgut stitches (4/0) are used to suture the two layers of the prepuce.

### Complications of circumcision

1. Reactionary haemorrhage.
2. Incomplete circumcision or removal of excess skin.
3. Phimosis follows healing of a large prepupital remnant as a result of incomplete circumcision. The fibrosis of healing leads to pin-point prepupital orifice.
4. Injury of the glans penis.
5. Urethral fistula. This is commonly due to a deep stitch used for haemostasis.
6 Meatal ulcer & meatal stenosis.
7. Acute retention of urine.

# APPENDICECTOMY

✶ ***Can be done either open or laparoscopic.***

## Indications

1. Acute appendicitis:
   - Urgent.
   - Interval.
2. Recurrent subacute appendicitis.
3. Carcinoid tumours that are confined to the appendix and are smaller than 2 cm.
4. Mucocele of appendix.

## Contraindications

- Appendicular mass & abscess.

## OPEN APPENDICECTOMY

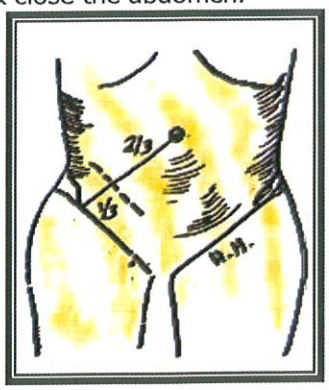
➢ **Position:** Supine.

➢ **Anaesthesia:** General or spinal anaesthesia .

- The first step in the operation is to "examine the patient under anaesthesia".
- If appendicular mass is detected, the operation should be postponed.
- If appendicular mass is detected after opening the abdomen, put a drain & close the abdomen.

➢ **Incision:** Is either

- McBurney's incision Or
- lower right paramedian incision.

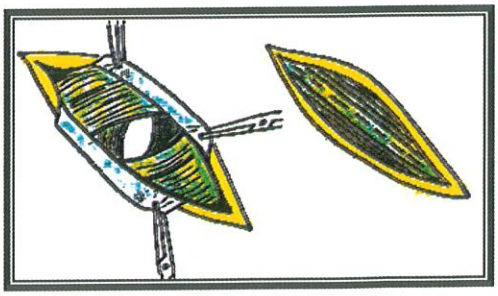



### [A] McBurney's incision (muscle splitting incision):

➢ **Indication:** Used in case with sure diagnosis of appendicitis.

➢ **Method:**

1. Skin incision 2 inches long centered over a point at junction of lateral 1/3 with medial 2/3 of a line joining ASIS and umbilicus.
2. External oblique aponeurosis is incised in same direction as skin (= direction of external oblique fibers).
3. Split internal oblique and deeper transversus fibers to expose peritoneum.



➢ **Advantages:**

1. The scar is small & cosmetic.
2. Direct approach to the appendix.
3. Needs little time to do and to close.
4. Incisional hernia is uncommon.

➢ **Disadvantages:**

1. It is not an exploratory incision, used only in sure diagnosis.
2. Any change in the position of the appendix makes it difficult to be exposed except by enlarging the wound as a muscle cutting one.
3. Injury to ilio-inguinal nerve leads to paralysis of conjoint tendon leading to direct inguinal hernia.

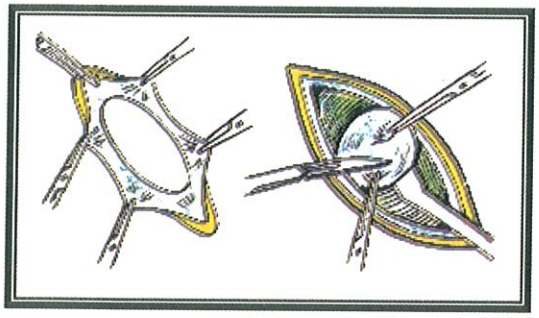
- The wound has **Grid iron pattern** i.e. the skin and external oblique are opened in certain direction.
- Internal oblique and transversus are opened in perpendicular direction.
- Finally, peritoneum is opened in the first direction.

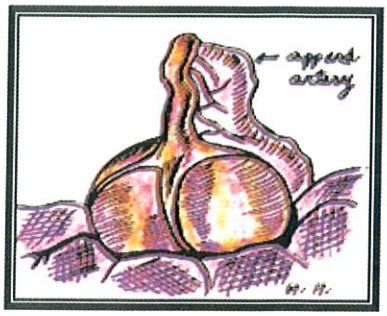
- Mc Burney's incision is located over the most tender point which is usually, but not always, the Mc Burney's point.
- Mc Burney's incision is muscle splitting and not muscle cutting.
- If there is any difficulty, the small incision can be enlarged by converting it into muscle cutting **(Rutherford Morison's incision)**.
- Internal oblique and transversus are divided in direction of the skin.

## [B] Right lower paramedian incision:

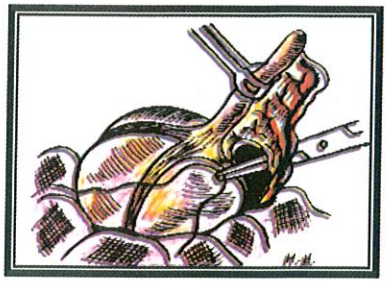
- **Advantages:** It is an exploratory incision when the diagnosis is doubtful.
- **Disadvantages:** It takes longer time and is more liable for incisional hernia.
- **Technique:**

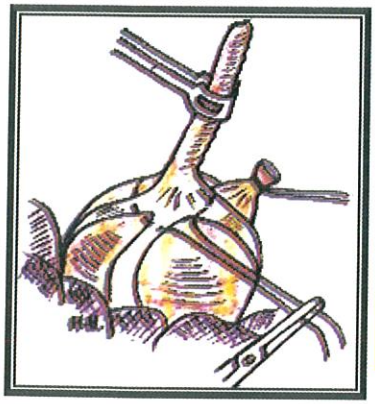
1. The peritoneum is opened & the cecum is delivered through the wound.





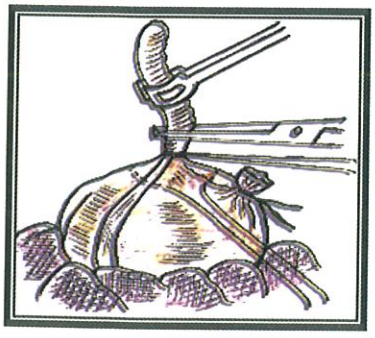

2. Appendix is reached by following one of the taenia coli.The appendix is elevated by a babcock's forceps exploring its mesentery.
3. The mesoappendix is clamped, lighted and cut to free the appendix.





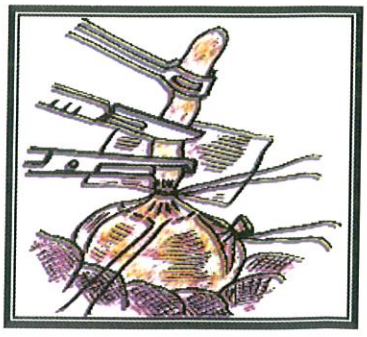
4. Purse string suture is made in the cecum around the base of appendix including seromuscular layers. It is left united until the appendix is removed.

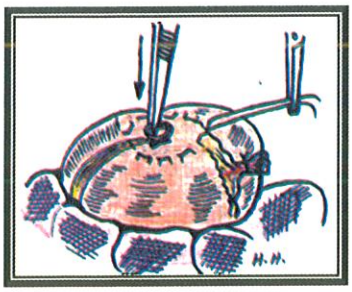
**N.B.:**
- The mesoappendix is cut flush with the appendix to leave a long stump above the ligature.
- Put the purse string suture in the taenia coli.



5. The base of the appendix is crushed by Kocher's forceps and at the site of the crush a ligature is applied.

6. The Kocher's forceps is applied distal to the ligature and the appendix is divided close to the forceps.





7. The stump is invaginated and the purse string suture tightened.

8. Ensure complete hemostasis.
9. Cecum is returned to the abdomen and wound is closed in layers.

**N.B.:**

- **If the appendix is adherent and retrocecal start by it base and follow it to its tip (i.e. retrograde appendectomy).**
- **If the appendix is not inflamed?**
  - Examine its tip to exclude carcinoid tumor.
  - Examine the cecum as an ulcer, inflammation & cancer can present as appendicitis.
  - Exclude crohn's disease & Meckel's diverticulum.
  - Palpate:
    - The posterior abdominal wall.
    - Ascending colon.
    - Liver edge & gall bladder fundus.
    - Bladder fundus.
    - Uterus, ovaries & tubes.
- **If interval appendicectomy is not performed, there is a high risk of a further attack of acute appendicitis.**

## Complications

- **General:** Shock, haemorrhage, pulmonary complications & DVT.
- **Local:**

1. **Bleeding** from the appendicular artery.
2. **Injury:**
   (a) Injury to ileum or cecum leading to fecal fistula.
   (b) Injury of ilio-inguinal nerve leading to inguinal hernia.
3. **Infection:**
   (a) Residual abscess either paracecal, pelvic or subphrenic.
   (b) Wound infection. (c) Portal pyemia.
4. **Paralytic ileus and acute dilation of stomach.**
5. **Adhesive intestinal obstruction.**
6. **Incisional hernia.**

**NB:** **Laparoscopic appendicectomy**

- **Advantages:** 1. Exploratory: The whole peritoneal cavity is inspected. 2. Less hospital stay. 3. Faster recovery.
- **This operation, however, is not yet as widely accepted and practiced as laparoscopic cholecystectomy.**

**NB:**

- **If cecum is severely inflamed & edematous** > Purse string suture & invagination of the stump is avoided & the stump is diathermized & covered by a patch of greater omentum to minimize infection.
- **Crushing of the base of the appendix is done to**
  1. Prevent slipping of the ligature.
  2. Make the stump gas tight.
  3. Displace contaminated contents
- **Crushing is not done if:** The appendix is edematous, congested or gangrenous.

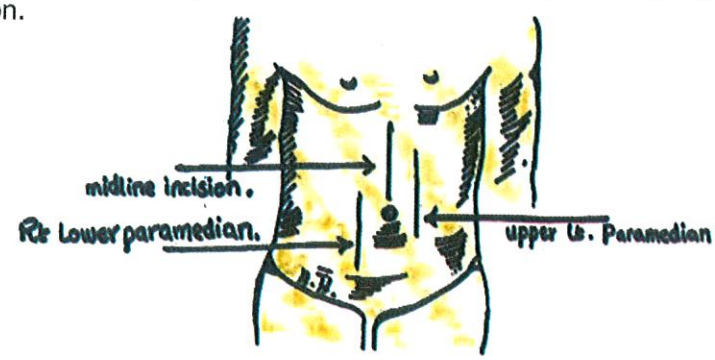
# ABDOMINAL INCISIONS

**Requirements** The requirements of a satisfactory abdominal incision are:

1. **Accessibility:** The incision should provide good exposure of the diseased area.
2. **Extensibility:** If needed, it should be possible to enlarge the incision to give more exposure.
3. **Safety:** The incision should have minimal damage to muscles, blood vessels and nerves. Muscle splitting incisions are preferable than muscle cutting ones.
4. **Good cosmetic result**: e.g. a transverse suprapubic incision is better looking than a low midline incision.

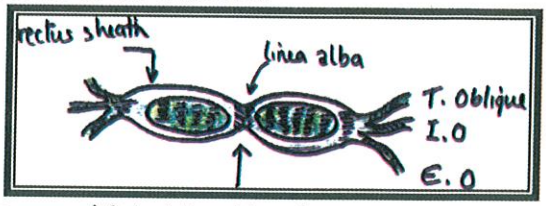
**Types**

## ⌦ Vertical Incisions:




### [A] Midline incision:

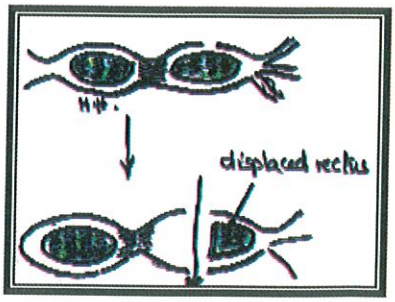
- **Method:**
  This incision passes through the linea alba.
- **Advantages:**
  1. Good exploratory allowing access to both sides of the abdomen.
  2. They can be quickly opened & quickly closed.
  3. Can be enlarged freely.
  4. They do not interfere with muscles or nerves.




- **Disadvantages:**
  Healing capacity is poor, so disruption of the wound & incisional hernia are common.
- **Closure:**
  Closed by a non-absorbable suture material as prolene to avoid incisional hernia and burst abdomen.

### [B] Paramedian incision:

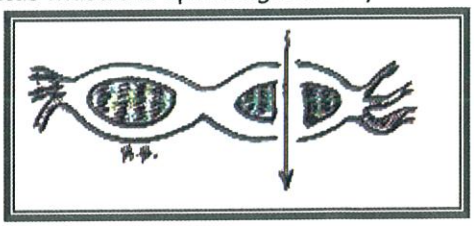
This is either upper or lower, right or left.




- **Method:**
  - Skin incision is one inch from the middle line.
  - The anterior rectus sheath is incised vertically, and the rectus muscle is displaced laterally to preserve the vessels and nerves supplying the rectus muscle from the lateral side.
  - Then the posterior rectus sheath and peritoneum are incised as one layer.
- **Advantages:**
  1. Safe and the healing power is strong.
  2. Extensible.
  3. Give exposure to any abdominal organ.
- **Disadvantage:** Time consuming and is, therefore, not recommended in emergency situations.

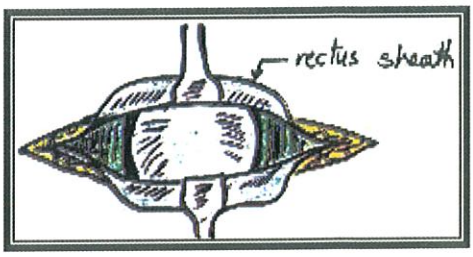
### [C] Paramedian transrectal incision:

- **Method:**
  Similar to the classic paramedian incision but the rectus muscle is split longitudinally in the same line of incision in the anterior rectus sheath.



- **Advantages:**
  It is done in emergencies because it is quick.
- **Disadvantage:**
  The scar is not as strong as that of the paramedian incision due to devitalization of the medial part of the rectus muscle.

## ⌦ Transverse Incisions:




- Upper transverse epigastric and low transverse suprapubic (Pfannensteil).
- In Pfannensteil incision in which the anterior rectus sheath is cut transversely, then the two recti are separated.
- Finally the posterior rectus sheath and peritoneum are opened.

- **Advantages:**
  1. The scar is cosmetic as the wound lies in Langer's lines & hidden in the pubic hair.
  2. The muscular tension on the suture line is minimal, and the patient can cough in the post-operative period.
- **Disadvantages:**
  1. It is time consuming.
  2. Excessive bleeding.

## ⌦ Oblique Incisions:

### [1] Subcostal incision:

On the right side it is called Kocker's incision.

- **Method**: It is a muscle cutting incision, one inch below and parallel to the costal margin. In its medial part the rectus muscle and the anterior and posterior rectus sheaths are divided. Laterally, the three abdominal muscles may be divided.
- **Advantages:** Very good exposure to the biliary apparatus or the spleen especially in obese patients with wide costal angle.
- **Disadvantages:**
  1. Muscle cutting resulting in a weak scar.
  2. It is not an exploratory incision.
  3. It is not extensible.
  4. Injury to the eighth, ninth or tenth intercostal nerves with subsequent hypoesthesia or paralysis of a part of the abdominal wall may occur.
  5. Not used in patients with narrow subcostal angle.

### [2] McBurney's incision: (see appendectomy)

### Complications of abdominal wounds:

1. **Hematoma.**
2. **Infection:** see before.
3. **Wound disruption (Burst abdomen):** This is a serious complication which may lead to an incisional hernia or may even cause mortality.
4. **Incisional hernia:** see before.
5. **Desmoid tumour.**

# WOUND DISRUPTION (BURST ABDOMEN)

## Predisposing factors

➢ **Pre-operative factors:**

1. Obesity.
2. Factors which cause poor healing as malnutrition, cirrhosis, corticosteroid intake.
3. Patents with respiratory problems as chronic bronchitis,
4 The nature of the primary disease: e.g. patients with abdominal malignancy.

➢ **Operative factors:**

1. Muscle cutting incisions are more liable to burst than muscle splitting ones.
2. Vertical incisions have a higher incidence of burst than transverse ones.
3. Rough surgical technique with excessive trauma to the muscles, blood vessels & nerves.
4. Use of absorbable sutures in the closure of the aponeurotic layer of an abdominal wound.
5. Insertion of drainage tubes through the main wound.

➢ **Post-operative factors:**

1. Persistent increase in intra abdominal pressure
2. Haematoma of the wound.
3. Wound infection is the most important factor.

## Types

1. **Partial:** The deep layers burst but the skin is intact.

2. **Complete:**
   The intestine prolapses out of the wound, it is called evisceration, but if they are retained inside the abdomen, it is called dehiscence.

## Clinical picture

- A warning sign is **"the red sign"** where a serosanguinous discharge soaks the dressing.
- The burst usually occurs on the sixth to the eighth day post-operatively.
- The patent often feels as if something gives way.
- Symptoms of intestinal obstruction may be present.

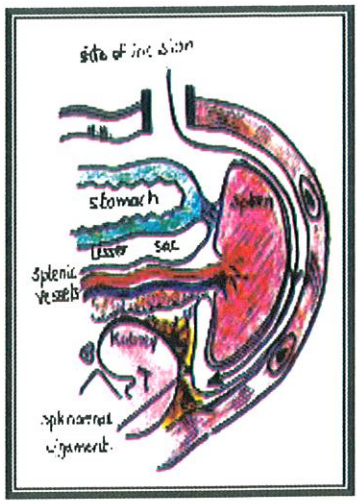
## Treatment

1. Cover the prolapsed bowel by a sterile dressing.
2. Insert a nasogastric tube and start an IV infusion.
3. In theatre under general anaesthesia, the protruding loops of bowel are washed with saline and returned to the abdominal cavity.
   - The omentum is spread over the intestine.
   - The abdominal wall is closed as one layer by through-and-through sutures using strong silk or prolene.
   - These are called "retention sutures" as they are retained for at least three weeks.
   - Care should be taken not to puncture a loop of bowel.
4. Antibiotics are prescribed and an abdominal binder is recommended.

# SPLENECTOMY

## Indications

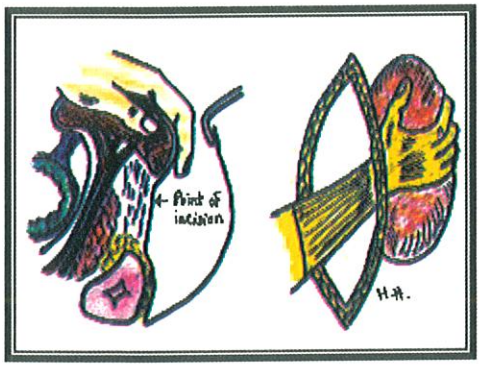
1. Traumatic injury of the spleen = Rupture spleen.
2. Haematological diseases:
   - Hereditary spherocytosis.
   - Idiopathic thrombocytopenic purpura.
   - Some patients with acquired haemolytic anaemia.
   - Some patients with thalassaemia.
   - Few patients with sickle cell anaemia.
3. Lymphomas: Splenectomy is performed for staging and to reduce the dose of radio or chemotherapy.
4. Portal hypertension.
5. Hypersplenism.
6. Splenic cyst, abscess or tumours.
7. During radical surgery for the stomach, oesophagus or pancreas.

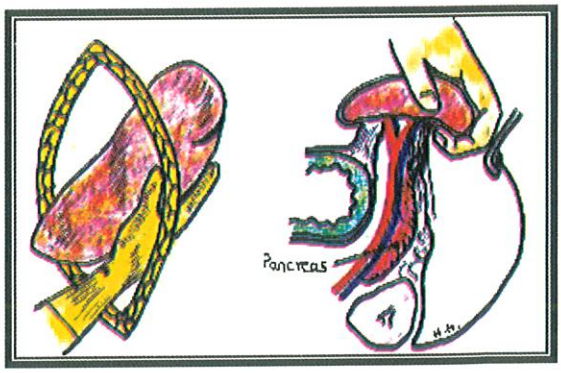



## Procedure

- **Anaesthesia**: General.
- **Position**:
  Supine with raising of table bridge beneath the lower thorax.
- **Incision**:
  Left upper paramedian or left subcostal incision or a midline supraumbilical incision is preferred in urgent cases or hemolytic jaundice to facilitate removal of diseased gall bladder.

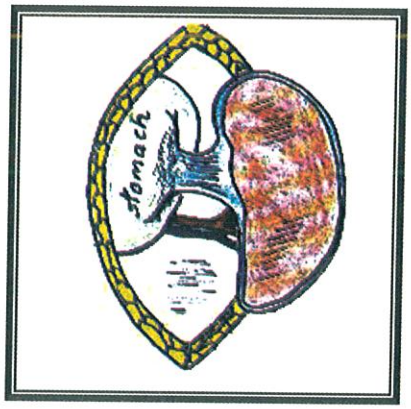
- The left hand is placed on the spleen which is drawn forwards, downwards and medially to divide the posterior leaflet of the lienorenal ligment and any fine adhesions to the diaphragm.

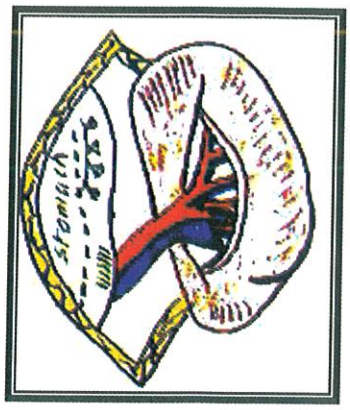


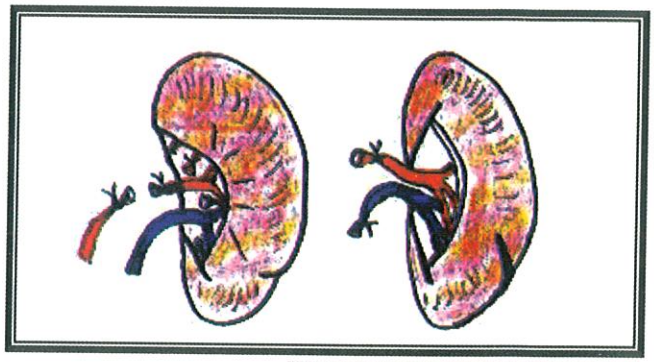

- The spleen is delivered through the incision. Lower pole first, followed by the upper pole.

- The short gastric vessels are ligated and divided The gastro-splenic ligament containing the short gastric & left gastro-epiploic vessels are divided between clamps and ligated.




- The splenic artery and vein are separated, clamped, divided and doubly ligated, taking care not to injure:
  (a) The tail of the pancreas.
  (b) The splenic flexure of the colon.



- Splenectomy is completed by dividing the residual peritoneal attachment to the stomach and colon.

- Good haemostasis. A drain may be left if there is uncontrollable bleeding or injury of pancreas.

- The incision is closed in layers.

**N.B.:**

1. **In cases of trauma:**
   Complete abdominal exploration is done to exclude other visceral injury.
2. **In cases of haemolytic anaemia:**
   (a) *If there are gall bladder stones*, cholecystectomy is done in the same setting **(splenectomy first)**.
   (b) *During splenectomy for hypersplenism*,
   remove all splenules as they may enlarge with recurrence of symptoms. (These lie in the gastrosplenic and lienorenal ligaments, greater omentum and near the pancreas).
3. **Massive adhesions**
   may contraindicate splenectomy and ligation of splenic artery is only done.

## Complications

### A) General:

1. **Shock.**
2. **Haemorrhage.**
3. **Infection which may lead to:**
   - Subphrenic haematoma or abscess.
   - Post-splenectomy fever: The spleen phagocytoses bacteria especially encapsulated type.
   - Increased risk of infection (post-splenectomy overwhelming infections) in children who have undergone splenectomy especially with Streptococcus pneumoniae and haemophilus influenza.
4. **Left basal atelectasis (collapse).**
5. **DVT.**
6. **Paralytic ileus.**
7. **Acute gastric dilatation.**
8. **Portal vein thrombosis:**
   Because splenectomy is followed by rise in white blood cells and platelets. This leads to portal HTN > post-operative haematemesis.

### B) Specific:

1. **Burst abdomen:**
   Pancreatic fistula may follow injury to the tail of pancreas. This condition may be accompanied by abdominal wound dehiscence.
2. **Injury to the wall of the stomach**
   during ligation of the short gastric vessels or injury to the diaphragm.
3. **Splenosis peritonii** may occur after removing ruptured spleen.

## Effects of splenectomy

- Hypertrophy of splenules.
- Hypertrophy of R.E.S and L.N.s enlargement.
- Red marrow replaces yellow marrow leading to bony aches in long bones.
- Blood picture improves after splenectomy for hypersplenism.
- Increased urinary loss of iron.

# CHOLECYSTECTOMY

## [I] Conventional cholecystectomy operation

### Indications

1. Acute cholecystitis.
2. Chronic calculus cholecystitis.
3. Severe chronic non-calculus cholecystitis resistant to medical treatment or complicated cases.
4. Injured gall bladder or cystic duct.
5. Gall bladder tumors (operable carcinoma of gall bladder).
6. Torsion of the gall bladder.
7. Mucocele & empyema of gall bladder.
8. Cholesterosis of gall bladder.

### Contraindications

1. Asymptomatic gall stones in unfit patient.
2. Liver cirrhosis (bleeding tendency).

### Position

Supine with the bridge of the table elevated behind the costal margin.

**Anaesthesia** General anaesthesia.

**Incision** 1. Rt. paramedian incision:

- It can be extended and it allows full exploration.
- It is indicated if the subcostal angle is narrow.

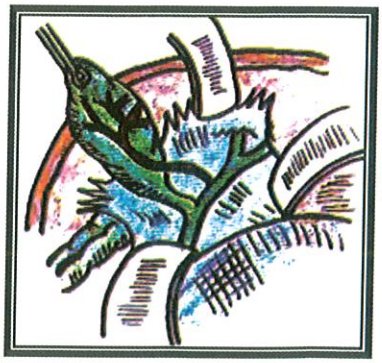
2. Rt. subcostal incision:

- It gives direct access to the gall bladder.
- It is a muscle cutting incision and may injure the ninth or tenth intercostal nerve.

***N.B.***

- Right upper quadrant transverse incision is an alternative to the Kocher incision & provides a good cosmetic result.
- Mini-cholecystectomy can be carried out through a short (5 cm) transverse incision with careful retraction. It gives an excellent cosmetic result.

- **The abdomen is explored**
  (stomach, duodenum, gall bladder, appendix and all other viscera to exclude other causes of dyspepsia or upper abdominal pain ,"Saint's triad or Wilkie's triad").



- **A forceps is applied** to the fundus of gall bladder & another one is applied to the Hartman's pouch.
  The gall bladder is pulled on to visualize the Y junction of the 3 bile ducts. The peritoneum over the junction of the 3 ducts is then incised and the cystic duct is dissected up to its junction with the common bile duct.

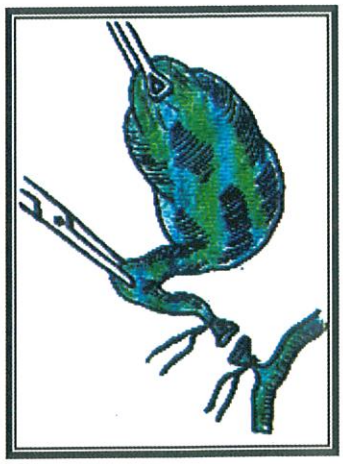
**N.B.:** **Calot's triangle:**

- Bounded by the inferior surface of the right lobe of the liver, common hepatic duct & superior border of the gall bladder.
- The cystic artery is found within it, ligated & divided

- **The cystic artery** is usually at a higher and more posterior plane than the cystic duct. **It is ligated and divided.**

- **An operative cholangiogram can be performed** at this step. The value is to demonstrate any stone in the common bile duct which appears as a filling defect.

***N.B.:***
Intra-operative ultrasound can provide useful aid to operative decision-making in surgery.



- **The cystic duct is ligated** about 5 mm lateral to the common bile duct and is then divided but avoid use of non-absorbable suture material.

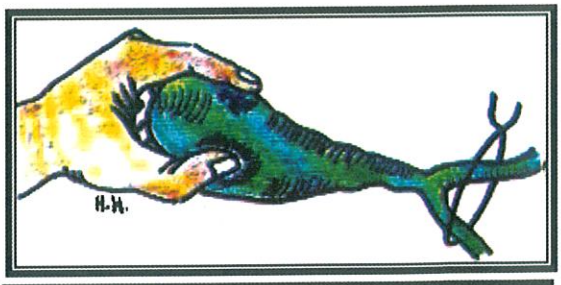
If it is wide, it may be advisable to transfix the stump with a 2/0 vicryl suture.

- **The gall bladder is dissected** from its bed. A few bleeding points may be present in the gall bladder bed and should be diathermised. If the separation is carried out in the correct plane (close to gall bladder) the bleeding is minimal.

**Drainage**

If the field is very dry, there may be no need for drainage, otherwise, a closed suction drain is left for few days.

## Fundus 1st cholecystectomy:



- Beginning from the fundus and going towards the cystic duct is preferred by some surgeons.

- This carries the risk of injury to the CBD which may be included in the ligature while traction is applied to the separated gall bladder.

## Complications of cholecystectomy

1. **Haemorrhage from cystic artery or Rt. Hepatic artery:**
   To stop bleeding from cystic artery insert a gauze pack for 3 minutes after which the bleeding vessel can be identified and ligated.
   *Another method* of control of bleeding form the cystic artery is the **Pringle's method.** The cystic artery is identified, clamped and ligated under vision.

2. **Injury to:**
   a. Injury to common bile duct or common hepatic duct by a clamp or ligature may lead to post operative jaundice.
   b. Injury to accessory cystic duct leads to biliary fistula.
   c. Liver failure from ligature of hepatic artery in mistake for a cystic artery > acute liver necrosis.
   d. Injury of liver substance.

3. **Infection:**
   Peritonitis, subphrenic abscess leading to paralytic ileus.

4. **Pulmonary complications.**

5. **Paralytic ileus and acute dilatation and DVT.**

6. **Incisional hernia.**

7. **Post-cholecystectomy syndrome**
   **with persistence or recurrence of the symptoms after cholecystectomy due to:**
   (a) **S**tone missed in the CBD.
   (b) **S**tricture of CBD.
   (c) Too long cystic duct **s**tump with redistension.
   (d) **S**pasm of the sphincter of Oddi due to biliary dyskinesia.
   (e) **S**orry diagnosis: Wrong diagnosis

**Wilkie's triad**

| | | |
|---|---|---|
| **1. Ch. peptic ulcer.** | **2. Ch. appendicitis.** | **3. Ch. calc. cholecystitis.** |

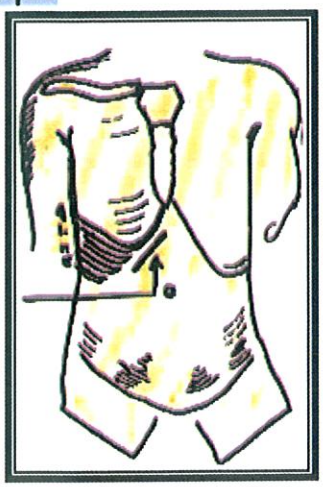
**Saint's triad**

| | | |
|---|---|---|
| **1. Hiatus hernia.** | **2. Diverticular disease of the colon.** | **3. Ch. calc. cholecystitis.** |

# CHOLECYSTOSTOMY

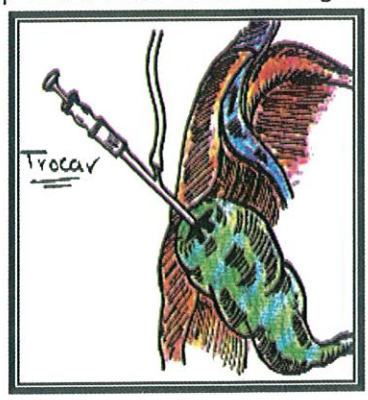
Though not a routine operation, cholecystostomy is a life saving procedure in poor-risk patients with acute cholecystitis or malignant obstructive jaundice.

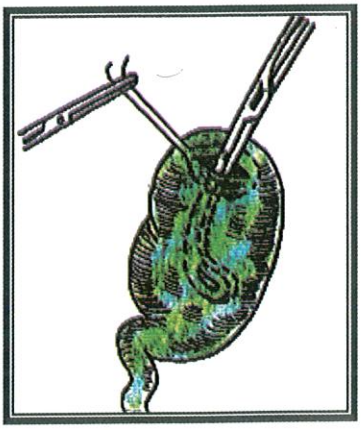
## Technique



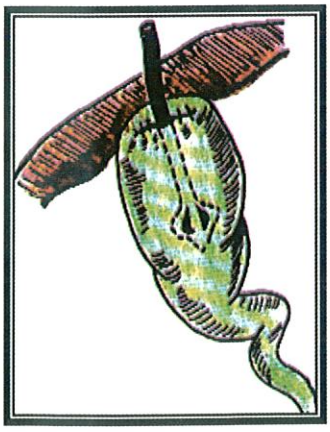
1.The fundus of the gall-bladder is exposed through a small subcostal incision with its center opposite the tip of the ninth costal cartilage.

A trocar is then inserted into the fundus to aspirate the fluid contents of the gall-bladder.

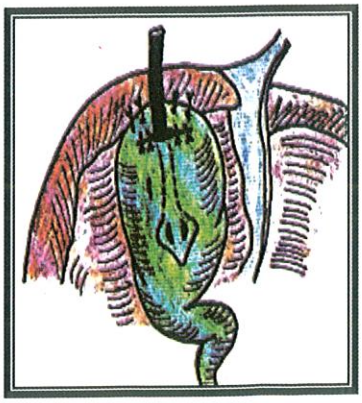


2. The opening is enlarged and a purse-string suture is inserted around it. A small scoop or fenestrated forceps is introduced to remove any stones and then the lumen of the gall-bladder is flushed with saline.



3. A small rubber catheter is inserted and anchored with a stitch and then the purse-string suture is tied snugly around it.



4. Finally, the fundus of the gall-bladder is anchored to the overlying peritoneum by two sutures and the wound is closed with drainage.

**N.B.:** For unfit persons, percutaneous cholecystostomy may be performed by an experienced radiologist under ultrasound guidance & local anaesthesia.

# COLOSTOMY

## Definition

This is an opening of the colon to the skin or surgical artificial opening of colon on the surface of the body.

## Indications

Colostomy is carried out for lesions of colon, rectum or anus either for formation of a permanent artificial anus in incurable conditions or for temporary fecal diversion before operation for curable conditions.

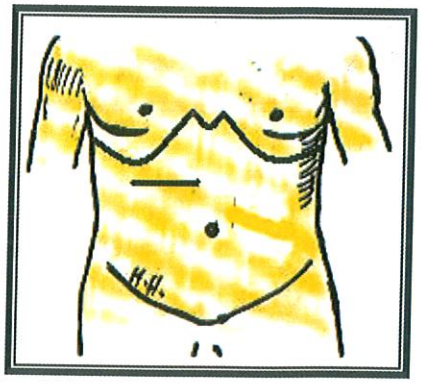
**[A] Carcinoma:**

1. As a palliative measure for inoperable tumor.
2. As a preliminary to radical resection (to prepare the colon).
3. As a sequeale to radical resection e.g. after abdomino-peritoneal resection.

**[B] Benign conditions:**

1. Congenital: Imperforate anus, microcolon or megacolon.
2. Traumatic: Injuries of colon or rectum.
3. Inflammatory: Diverticulitis.
4. Management of gangrenous colon e.g. strangulated hernia or volvulus.
5. To protect a doubtful distal colonic or rectal anastomosis.
6. Incurable cases of anal incontinence or high anal fistula.

## Types



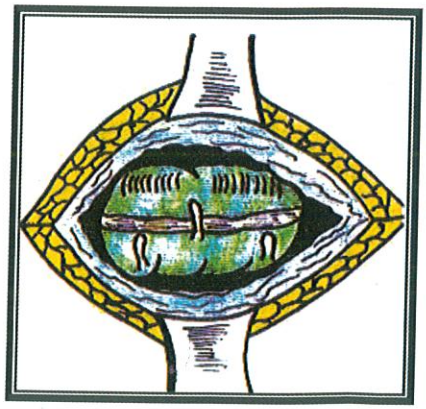
### 1. Simple loop colostomy:

➢ **Indication:**

It is done in mobile parts of the colon e.g. pelvic colon and transverse colon for permanent colostomy.

➢ **Method:**

- Through a small muscle cutting incision (transverse trans-rectal incision),

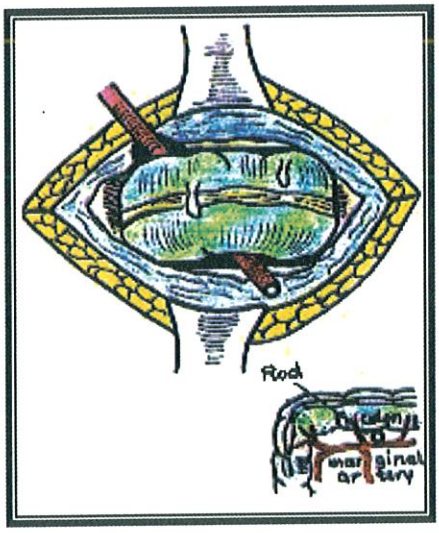


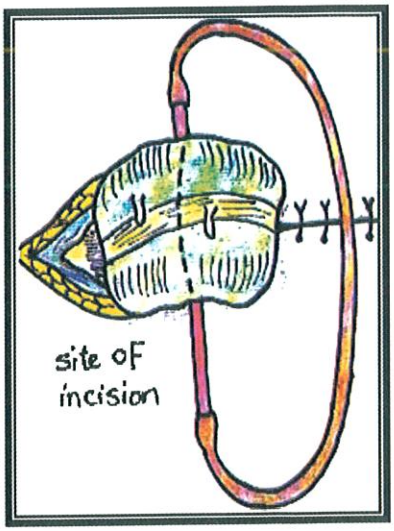
a loop from the proximal 1/2 of transverse colon (better blood supply) is brought out.

- A **glass rod** is then passed through the avascular area of transverse mesocolon (to prevent retraction of the loop)

close to the wall of colon (to avoid injury of the marginal artery)

and the wound is closed around the 2 limbs of the loop.



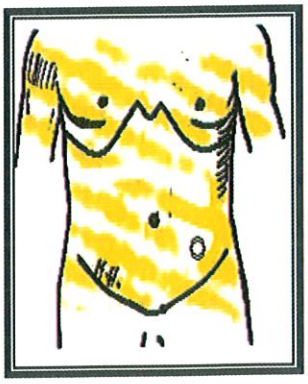




- *If there is **no** intestinal obstruction* the colostomy is opened after 48 hours by making a transverse cut passing through all layers except the serous layer posterior.

  *But if there is intestinal obstruction*, the colostomy is opened by the end of the operation.

- The glass rod is kept for **10-15 days** and is replaced by rubber tubing.

## 2. End colostomy (Terminal colostomy = Single barrel colostomy):

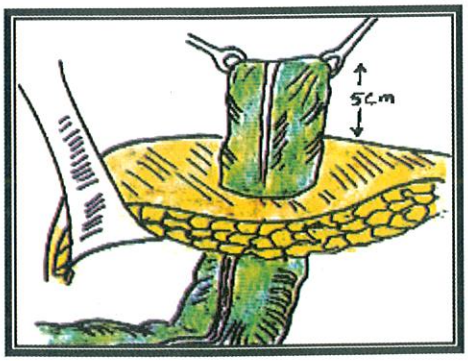


➢ **Indication:**

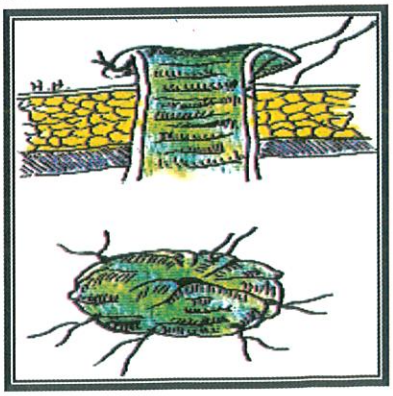
- After radical resection of rectum i.e. abdomino-perineal resectionm or as a first stage of Hartmann's technique.

➢ **Method:**

- May be permanent or temporary.
- Usually constructed in the left or the sigmoid colon.

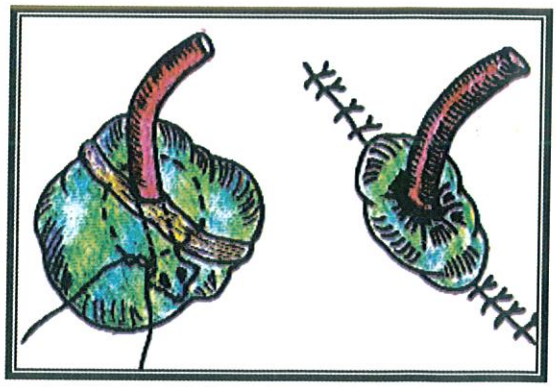



- Bring out the proximal cut end of sigmoid colon through an incision in the left iliac fossa midway between the umbilicus and ASIS.



- The colon is fixed to the abdominal wall muscles and is then stitched to the skin to form permanent or temporary artificial anus.

## 3. Caecostomy:



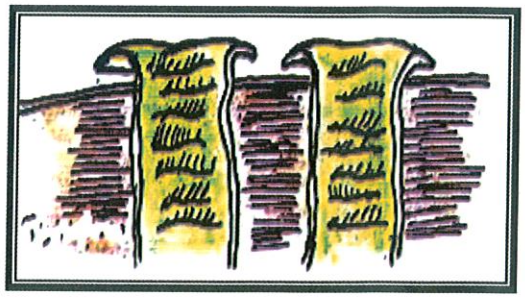
➢ **Indication:**

- Occasionally used for temporary decompression of colon in advanced obstruction of the right half of colon.

➢ **Method:**

- It is not as effective as the loop colostomy.
- It is done by inserting a wide bore tube into the cecum.
- Two purse string sutures are used to prevent leakage around the tube.

## 4. Devine's Defunctioning Colostomy:



➢ **Indication:**

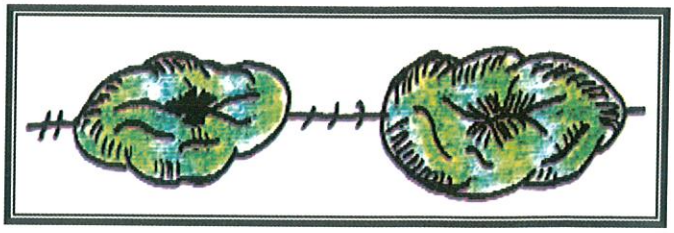
- Done only to transverse colon as it is performed for "colonic preparation" preliminary to resection of distal colon.

➢ **Method:**

- It is similar to double barrel colostomy but the 2 opening are kept wide apart to prevent soiling of the distal loop by feces. Its closure needs a special enterotome.

N.B: **Double-Barrel Colostomy(Paul Mikulicz operation= Exteriorization resection):**
Is an old technique which **not** used nowadays

## Closure of colostomy:



- Elliptical incision is made around mouth of colostomy.
- Colostomy loop is freed down to peritoneum without opening peritoneum.
- Mouth of colostomy is trimmed and closed by interrupted Sutures in two layers.
- Wound muscles and skin are closed with drainage.

**N.B.:**
**Some surgeons open peritoneum freely and do intra-peritoneal closure of colostomy, preparation of colon is essential.**

### Colostomy Complications

1. Skin excoriation.
2. Prolapse of colostomy loop.
3. Retraction of colostomy loop.
4. Necrosis or gangrene due to inadequate blood supply to colostomy.
5. Stenosis of the orifice.
6. Colostomy hernia: This is either external coming out through the anterior abdominal wall opening beside the colon end, or internal between the colon and the parietal peritoneum.
7. Internal strangulation.
8. Obstruction of colostomy opening by fecal mass, scar tissue, stenosis of skin opening or kinking of colostomy loop.

## HAEMORRHOIDECTOMY

### Indications

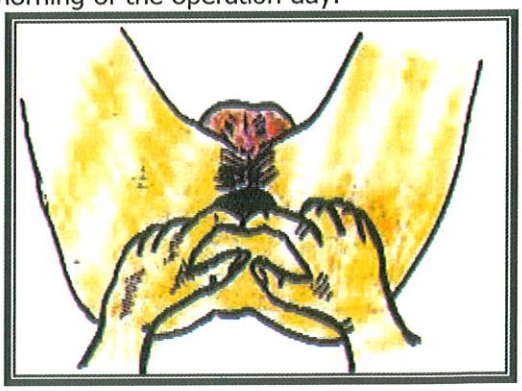
- 3rd & 4th degree piles.
- Associated pathology requiring surgery e.g. fistula or fissure.
- Complicated piles.
- Piles with arterial pulsations felt in the pedicle.

### Contraindications

- 1st & 2nd degree piles (treatment is conservative).
- Secondary piles (treat the cause).

### Pre-operative preparation

1. Laxatives 48 hours before the operation.
2. Light non-residue diet 24 hours before the operation.
3. An enema before going to bed & another on the morning of the operation day.

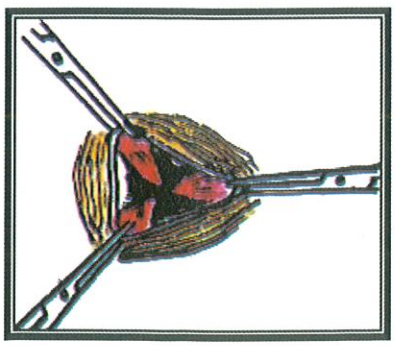


➢ **Anaesthesia:** General or spinal.

➢ **Position:** Lithotomy.

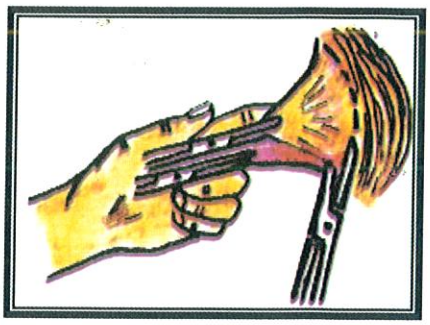
➢ **Technique:**

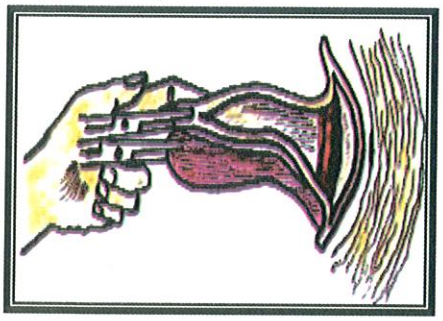
1. PR, proctoscopic examination under anaesthesia to exclude rectal carcinoma or other lesions.



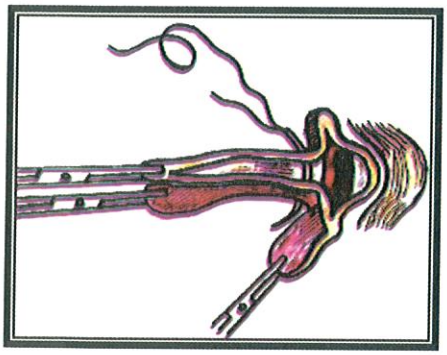
2. Dilatation of anal sphincter up to 4 fingers to obtain clear view of piles to avoid post-operative painful spasm & retention of urine.
3. Bladder forceps is applied to mucocutaneous junction. By slight traction, the mother pile bulges out.
4. Artery forceps are applied on the pedicle of each pile.

5. **Dissection & transfixation excision of each pile:**
   - Start with 7 O'clock, then 3 O'clock & finally 11 O'clock. **Lower pile is removed first** so that bleeding does not mask the field of higher one.
   - Both bladder & artery forceps of one pile are taken in one palm with index finger inside anus to act as guide to support the pile.

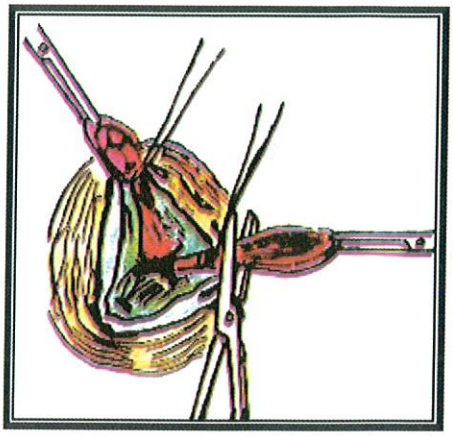




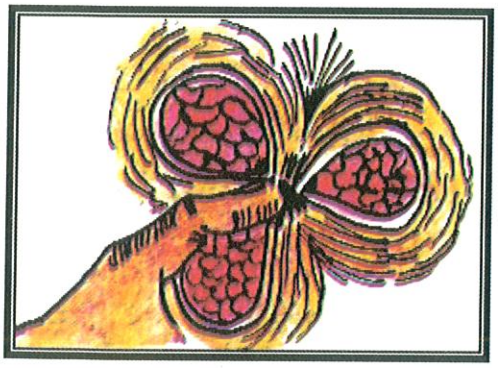
   - With a scissor in the other hand, **V-shaped cut** is made in skin opposite pile.
   - This area of skin is dissected until anus is reached. Dissection is continued up in anal canal submucosally (elevating mucosa with adherent pile mass), until artery forceps marking the pedicle is reached.
   - Kocher's forceps are then applied to crush the pedicle.

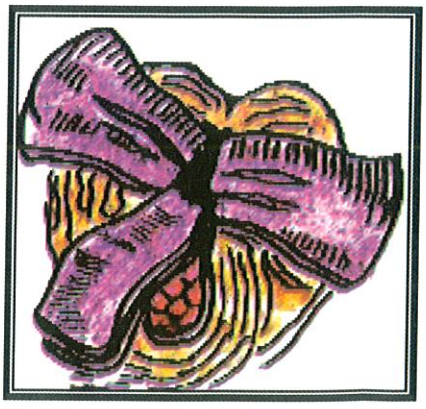


   - Crushed pedicle is ligated with absorbable suture by transfixation.



   - The pile is cut leaving ½ inch stump to avoid slipping of ligature. Other mother piles are similarly removed.





6. Finally, there 3 raw surfaces opposite the 3 mother piles.
   Bridges of skin & mucosa should be left intact between the 3 raw surfaces to allow healing, otherwise anal stricture results.
7. **3** pieces of gauze soaked in tannic acid or betadine solution are inserted to cover the raw areas.
8. Large pad of gauze is applied on anus .

## Post-operative care

1. Gauze is removed after 48 hours.
2. Daily dettol baths after defecation.
3. Laxatives: Lactulose & bran > well formed lubricated stool > dilatation without injury.
4. PR examination is started from 7th day & continued every other day until complete healing (about a month) to prevent anal stenosis.
5. Pethidine is given every 6 hours for 48 hours.
6. Fluids only are given for 2 days.

## Complications

1. **Severe pain:** Morphine.

2. **Retention of urine:** Common, due to reflex spasm of bladder neck from pain.
   - Management: Relieve pain + Doryl injection + Application of hot packs on lower abdomen + Trying micturition in front of running tap. **NEVER** rush to catheter.

3. **Reactionary haemorrhage:** Within the first 24 hours.

4. **Secondary haemorrhage:** After 7 days, due to infection.
   - Management: Morphine + Antibiotics + Elevating foot of bed + Packing around a tube + Blood transfusion in severe cases.

5. **External skin tags (external piles) from:**
   (a) Inadequate removal of external piles.
   (b) Post-operative edema.
   - Management: Excision under local anaesthesia.

6. **Anal stricture:** Due to removing excess skin or mucous membrane.

7. **Recurrence:** Occurs in younger patients from enlargement of daughter piles.
   - Management: Injection.

# GASTROSTOMY

**Definition** Making artificial fistulous communication between the stomach & the surface of anterior abdominal wall through which the patient can be fed.

**Anaesthesia** General or local.

**Position** Supine.

**Indications**

[A] **Temporary:**

1. Congenital atresia of oesophagus.
2. Traumatic: Rupture oesophagus due to instrumentation.
3. Post-corrosive stricture.
4. Operable tumors of the mouth, pharynx or oesophagus.
5. To decompress the bowel as an alternative to post-operative naso-gastric intubation.

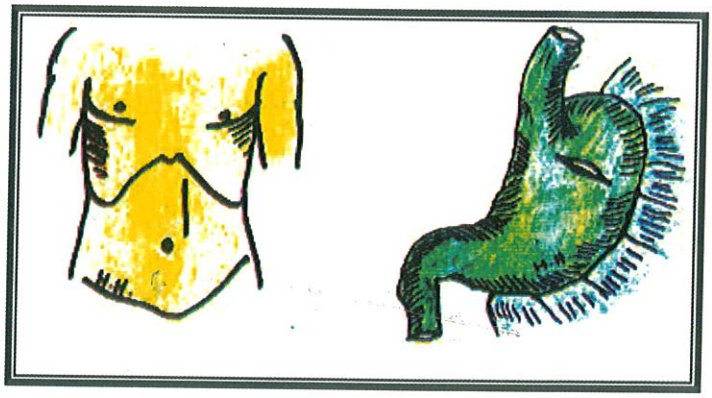
[B] **Permanent:** Irremovable tumors of the mouth, pharynx, oesophagus or cardia of the stomach.

**Technique**

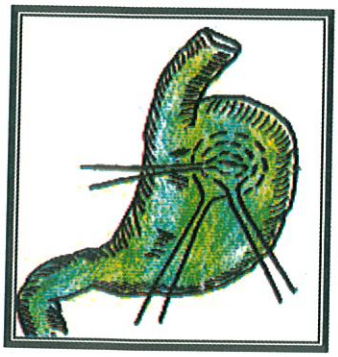
1. **Stamm's gastrostomy:**

Temporary procedure (serous lined).

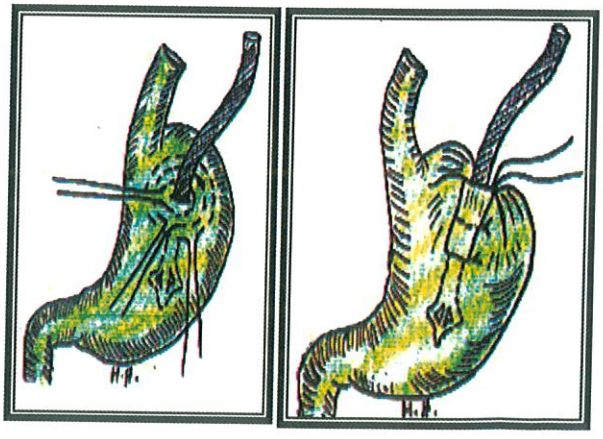
- An opening is done in the anterior wall of the stomach nearer to the fundus and midway between the lesser and greater curvature.



- A self retaining gastrostomy tube is passed through this opening.

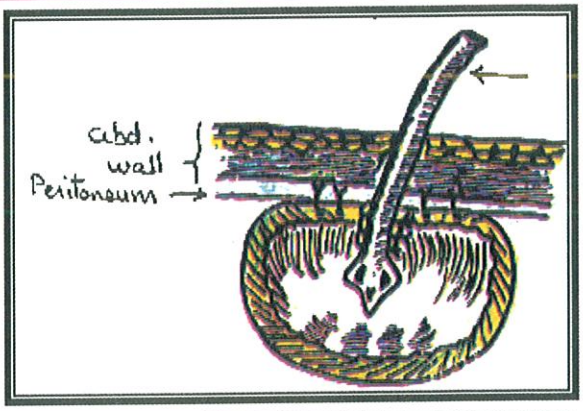


- 3 purse string sutures (sero-muscular) are applied around the opening.



- The tube is pushed into the lumen of the stomach
- The purse-string sutures are tied invaginating the opening inwards.
- The tube is brought out through a tightly fitting stab wound in the left upper quadrant.

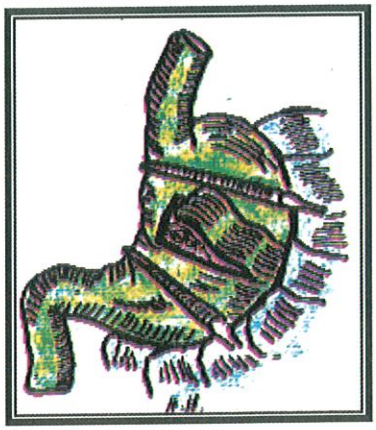
- The stomach is firmly attached to the abdominal wall by sutures.
- When the gastrostomy is no more needed, the tube is simply pulled out. The track will close spontaneously because it is lined by serosa.



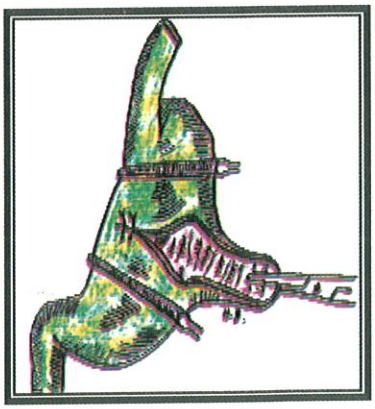

## 2. Depage-Janways gastrostomy:

Permanent gastrostomy (mucous lined).

- A tube is constructed from the anterior wall of the stomach, which is mucous lined.



- The tube is brought to the surface and fixed to the skin.



**N.B. Gastrostomy, can be done endoscopically**

# SURGICAL TREATMENT OF VARICOSE VEINS

## Indications

1. Large 1ry V.V.
2. Incompetent valves of long saphenous or short saphenous.
3. Presence of complications (superficial thrombophlebitis, Hge, ulcer ... etc.)
4. Cosmetic reasons.
5. Incompetent communicators.
6. Severe symptoms.
7. In secondary varicose veins, it can be done if deep veins are patent (canalized deep vein thrombosis), but just in addition to conservative treatment.

**Contraindications** Occluded deep system

**Anaesthesia** General or spinal. **Position:** Supine.

**Methods** Depend on extent of varicosity and number of blow outs.

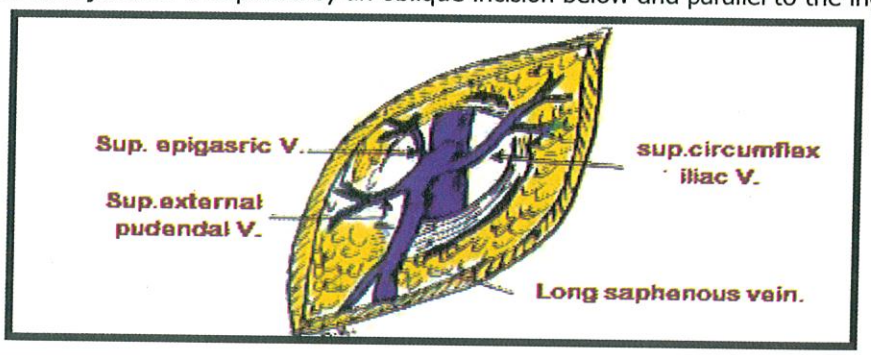
## Trendlenburg's Operation (Sepheno-femoral connection)

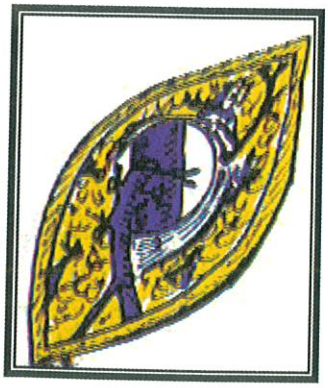
➢ **Indication:**

- Early cases with isolated saphenofemoral incompetence only.

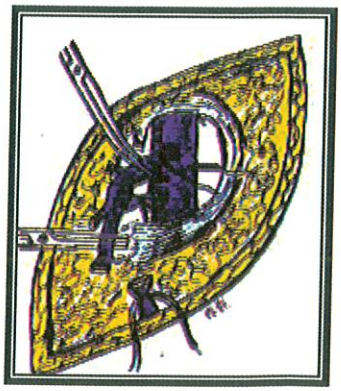
➢ **Method:**

- The saphenofemoral junction is exposed by an oblique incision below and parallel to the inguinal ligament.



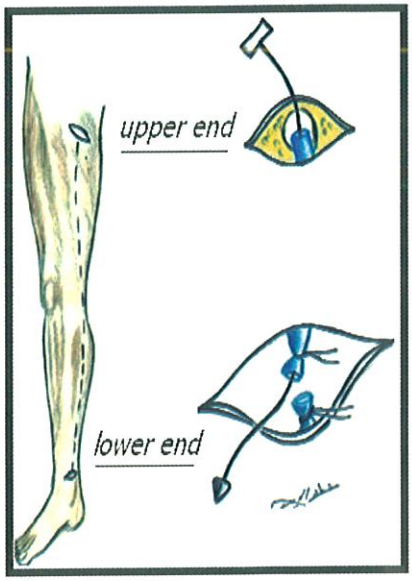



- The superficial circumflex iliac, superficial epigastric and superficial external pudendal veins, deep external pudendal, accessory saphenous are identified, ligated and divided near termination of long saphenous.



- The long saphenous vein is ligated and divided flush with the femoral V. proximal to any tributaries (otherwise recurrence occurs) then dissect it down and excise its upper 2 inches.
- Don't divide the long saphenous vein until its junction with femoral vein has been identified.
- If at any stage major venous bleeding occurs, the greatest danger is that the surgeon may apply artery forceps blindly in the depth of the wound & by so may cause damage to the femoral artery or vein.

## Subcutaneous Stripping of Long Saphenous Vein

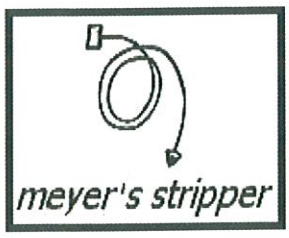



➢ **Indication:**

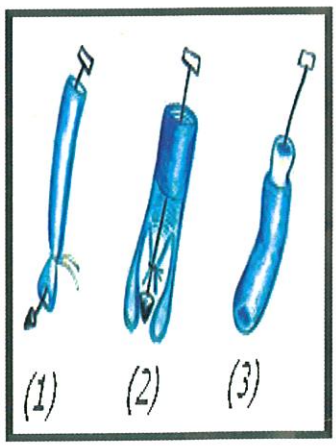
- The whole system is removed if it is severely affected or there are multiple incompetent perforators.

➢ **Method:**

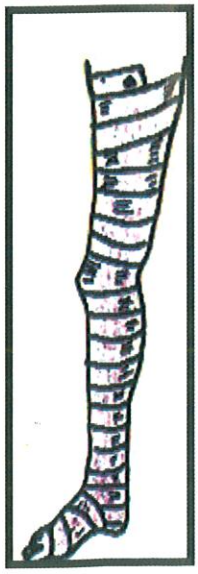
- Trendlenburg's operation is done as before.
- The lower end of long saphenous vein is exposed by a small transverse incision just above the medial malleolus and protect the saphenous nerve.
- The lower end of the vein is divided and its distal end is ligated then through its proximal end.




**Meyer's stripper** is pushed from below in the direction of valves until it appears in the upper incision.



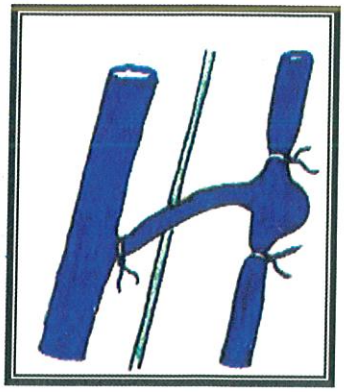

- The lower end of the vein is ligated round the stripper then the stripper is pulled from its upper end stripping the long saphenous vein while immediate pressure bandage is applied to prevent haematoma formation.



***N.B.:***

1. If long saphenous is relatively normal, it must be left alone as it may be needed for arterial by pass graft.
2. In severe serpentine varicose veins, stripping is performed through "multiple incisions".
3. Local excision of varicose veins: For localized extensive varicosities.
4. Avulsion of all varicose tributaries through multiple incisions placed over them.
5. A stripper should be palpable through the skin throughout its course.
6. A stripper which becomes impalpable may have entered the deep veins & must be withdrawn with great care to avoid damage.

## Open subfascial Ligation of Incompetent Perforators (Triple Ligature or Cockett's Operation)



➢ **Indication:**

- 2-3 Incompetent perforators (usually performed on ankle perforators).

➢ **Method:**

- The blow out is exposed by a vertical incision in the lower ½ of the leg 1 inch behind and parallel to medial border of tibia.
- The long saphenous vein is ligated both above and below the blow out as well as the perforator is ligated (subfascial) & the intervening portion of the vein is excised.

## Endoscopic subfascial ligation

### Subfascial endoscopic perforator surgery (SEPS)

➢ **Advantage:**

1. Better cosmetics.
2. Done under vision so, more sure identification of perforators.

***NB:***

**Alternative tech.to destroy the main saphenous systems.**

a. Radiofrequancy abalation
   using a catheter which is passed up through a saphenous vein.

b. Endovascular laser ablation.

# THYROIDECTOMY

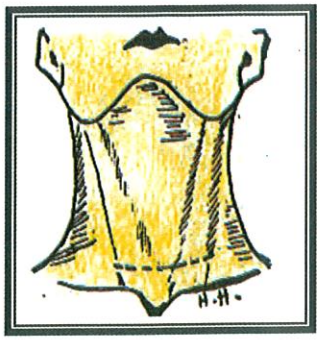
## Indications

1. **Unilateral lobectomy (lobectomy+ isthmectomy):**
   (a) All solitary nodules.
   (b) Multinodular disease in one lobe only.
2. **Subtotal thyroidectomy :**
   (a) Diffuse toxic goitre.
   (b) Bilateral toxic multinodular goitre.
   (c) Bilateral simple multinodular goitre.
3. **Total thyroidectomy :** Papillary, follicular & medullary carcinoma.
4. **Isthmectomy:**
   (a) Anaplastic carcinoma & lymphoma to decompress airway & obtain tissue diagnosis.
   (b) Riedel's thyroiditis.
   (c) Nodule in the isthmus.

**Near total thyroidectomy** = lobectomy + isthmectomy + subtotal lobectomy on the opposite side.

## Contraindications

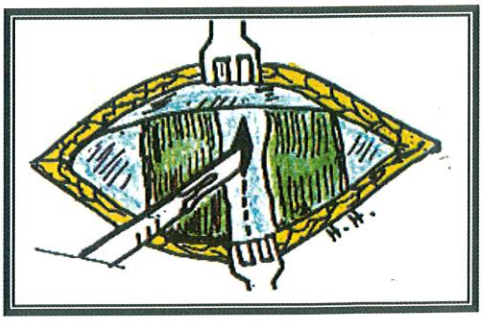
- Better avoided in patients less than 25 years.
- Toxic goiter with recent progressive exophthalmos.
- Toxic goiter with increased antibody titre: i.e. the cause is thyroiditis.



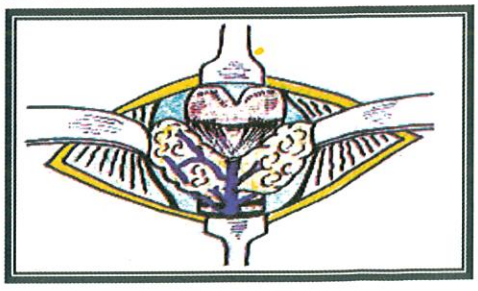
## Partial or subtotal Thyroidectomy

- **Preoperative investigations & preparation:** see before.
- **Anaesthesia:** General endotracheal anaesthesia.
- **Position:**
  Supine with tilting the head of table 15° upwards (to avoid congestion) with hyperextension of neck by pillows (or elevate the table bridge) beneath the shoulders.
- **Incision:**
  - Lower collar or Kocher's incision one inch above the suprasternal notch.
  - The incision extends from the posterior border of one sternomastoid to the posterior border of the other sternomastoid.
  - This incision cuts the skin and platysma.
  - Then this skin flap is reflected to the level of hyoid bone.
  - The lower flap may be dissected to the suprasternal notch to expose freely the deep fascia.
  - The platysma is elevated with the skin as the blood vessels to the skin pass through the platysma.

  Incision is done vertically between pretracheal muscles in the middle line.

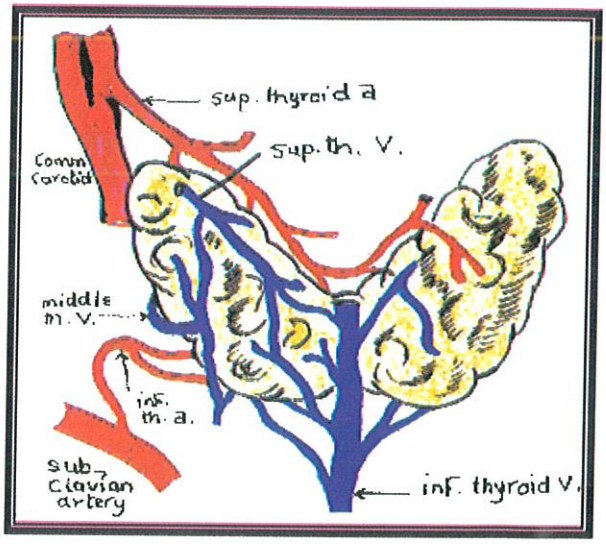


- **The muscles** are retracted laterally or divided.

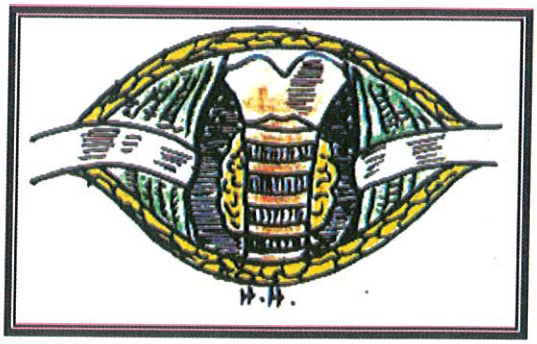


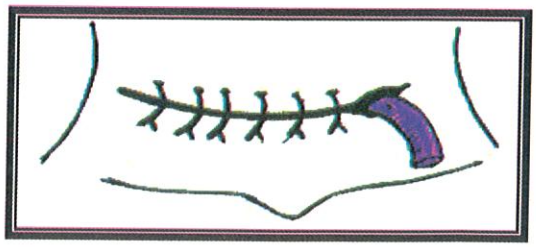
- If the division of the strap muscles is necessary, they should be divided high up as their innervation is from below. They are repaired at the end of the procedure.
- A muscle cutting incision is done in:
  * Malignant goitre.
  * Toxic goitre (to avoid pressure on the gland).
  * Huge goitre.

## blood supply of the thyroid gland




- **The middle thyroid vein** is ligated and cut. The lateral lobe can be delivered through the wound.
- **Middle thyroid vein** should be the first vessel to be ligated, to facilitate mobilization of the thyroid lobe.
- **The superior thyroid vessels** are ligated and cut near the upper pole of the thyroid.
- **The inferior thyroid artery** is ligated in continuity (ligated and not divided) behind the carotid sheath far from the gland to avoid injury of the recurrent laryngeal nerve.
- Some surgeons don't ligate the inferior thyroid artery to avoid vascular injury of parathyroid glands.
- **Inferior thyroid veins** are ligated and cut.
- The same is repeated on the other side.
- The lateral lobes are resected with its isthmus in such a way that the posteromedial part of the gland is left behind protecting the recurrent laryngeal nerve and parathyroid glands, maintaining the function of the thyroid gland.
- Haemostasis or control of bleeding is done either by ligature or by diathermy.



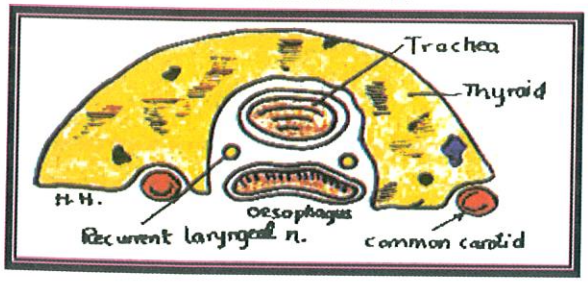



### ➢ Closure and drainage:

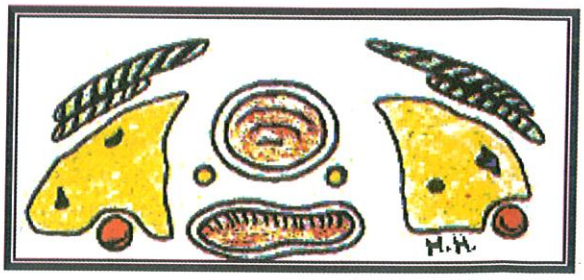
- The pretracheal muscles are approximated together.
- Corrugated rubber tube drain is put and its end is allowed to come from the angle of the wound.
- The platysma muscle is closed as separate layer (after removal of the pillow).
- The skin is closed by fine prolene or by clips.

### *Transverse section*

***Before the operation***




***after the operation***



## Complications after thyroidectomy

- Apart from general surgical complications (shock, hemorrhage, infection, pulmonary complications and deep vein thrombosis).

### [1] Post-operative thyroid crisis (Storm):

This is a condition of **"acute hyperthyroidism"**

➢ **Incidence :** Rare nowadays due to the good preparation & control of toxicity before operation.
- It can occur during the course of the disease excited by severe nervous disturbance or a minor operation e.g. extraction of a tooth or incision of an abscess.
- More commonly it occurs after subtotal thyroidectomy. It usually starts within the 1st few hours to 48 hours after the operation.

➢ **Manifestations :**
1. Hyperpyrexia : Temperature may rise to 41 °C or more.
2. Rapidly rising pulse rate : 160 or more, may be irregular.
3. BP rises greatly, systolic & diastolic (e.g. 250/120). The pulse pressure is high, so HF may occur.
4. Muscular excitability up to convulsion.
5. Dyspnea due to lack of $O_2$ as the metabolic rate is greatly increased.

➢ **Fate :** The condition, if severe, and if left untreated, death occurs in short time.

➢ **Treatment :** Should be urgent :
1. Ice packs to the limbs, head & abdomen: In severe cases the whole patient may be immersed in cold water or ice.
2. β-adrenergic blockers (Inderal) : I.V. drip until the pulse drops to about normal should be given carefully under ECG control.
3. Morphia for sedation.
4. $O_2$ inhalation is essential & I.V. hydrocortisone (25mg).

### [2] Reactionary hemorrhage :

- Results from continuous venous ooze following bad haemostasis. This hemorrhage is serious because it collects under deep fascia, compressing trachea. Suffocation may occur.

➢ **Management:**
1. Immediate reopening of the wound.
2. Then transferring patient to theatre to explore the operation field under anesthesia and ligate bleeders.

### [3] Dyspnea: May be due to :
1. Reactionary hemorrhage.
2. Bilateral RLN injury = Spasm of both cords = Severe dyspnea= Urgent tracheostomy (immediately after extubation).
3. Laryngeal edema from rough intubation (= tracheostomy).
4. Tracheal collapse from tracheomalacia (= tracheostomy).
5. Thyrotoxic heart failure (propranolol - digitalis).

### [4] Change of voice:

| | | |
|---|---|---|
| 1 | Unilateral RLN injury | Hoarseness |
| 2 | Bilateral RLN injury | Aphonia |
| 3 | External laryngeal nerve injury | Loss of high-pitched voice |
| 4 | Tracheitis and laryngitis | May cause temporary change in voice |

**[5] Injury of nerves related to thyroid :**

| Effects of RLN injury (on voice and respiration) | | | |
|---|---|---|---|
| 1 | Unilateral injury | Paralysis of one cord | Hoarseness + Dyspnea on exertion |
| 2 | Bilateral injury | Spasm of both cords | Aphonia + Stridor |

- 3% of people have RLN paralysis (without operation) may be due to viral infection → neuritis. So do preoperative laryngoscopy (medico-legal).

**[6] Tracheitis and laryngitis** = Temporary change of voice + dyspnea.

**[7] Surgical emphysema:** =tracheal injury = immediate suturing

**[8] Hypoparathyroidism:**

- Rarely occurs if all parathyroid are removed, or their vessels injured.

➢ **Clinical picture:**

- *Latent* (serum Ca=7-9mg%): tingling & numbness in fingers & circumoral. ,+ve Chovestek sign.
- *Manifest* (serum ca < 7 mg%): carpopedal spasm, dyspnea.

➢ **Emergency treatment :** 20 ml of 10% calcium gluconate IV slowly.

➢ **Maintenance treatment :** Ca + Vit D.

**[9] Progressive exophthalmos:**

➢ **Management :**

1. Thyroxin to inhibit pituitary.
2. Preventing progression by sleeping semi-sitting and cortisone.
3. The eye is protected by :
   (a) Tarsorrhaphy.
   (b) Orbital decompression in malignant exophthalmos.

**[10] Hypothyroidism :** If enough thyroid tissue is not left.

**[11] Recurrence :** Of toxic or nodular goitre.

**[12] Keloid in the scar :**

Occurs in low wounds on sternum. It is avoided by placing the incision in the lower neck crease.

**N.B.:**

- **Identification and protection of RLN on both sides:**
  It is sought first below inferior thyroid artery as it passes obliquely upwards and forwards, then between the branches of inferior thyroid artery, finally it enters larynx immediately behind inferior corm of thyroid corm of thyroid cartilage. Variations in RLN course should be considered, to facilitate its identification. Some surgeons do not search for RLN as searching for it may injure it.
- **Identification and protection of parathyroid glands:**
  Normally, there are 4 parathyroid glands lying behind thyroid poles within pretracheal fascia. They are of pe size and orange colour. They preserve their endarteries. At least one is preserved.
- **It is essential to leave a part of the gland to maintain the patient in an euthyroid state (Surgeon's experience is essential):**
  1. For toxic goitre: The amount suggested equals 1/3 of normal lobe.
  2. For S.N.G: Leave an amount of gland on each side equal to normal lobe = distal phalanx of the thumb.

# TRACHEOSTOMY

## Indications

**[A] Upper respiratory obstruction (Urgent tracheostomy):**

1. Acute laryngeal obstruction by:
   (a) Foreign bodies impacted in the larynx.
   (b) Acute edema of the glottis.
   (c) Bilateral incomplete cord paralysis > adductor spasm.
   (d) Acute perichondritis of the laryngeal cartilage.
   (e) Diphtheritic laryngitis.
2. Improve respiratory function e.g. chest injury & flail chest.
3. Malignant tumors of tongue, pharynx or larynx.
4. Before operations on tongue, pharynx or larynx.
5. Severe facial, oral or cervical injuries and burns.
6. Respiratory paralysis e.g. tetanus & bulbar poliomyelitis.
7. Tracheomalacia.

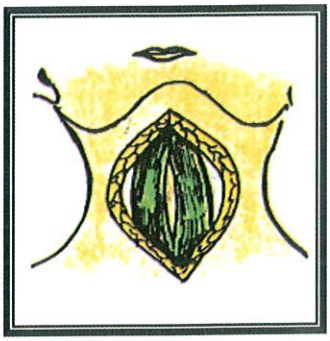
**[B] Deliberate indications (Elective tracheostomy):**

1. Severe chest infection.
2. Prolonged coma (if endotracheal tube is applied for more than 10 days to avoid laryngeal stenosis).
3. Severe postoperative chest infection.

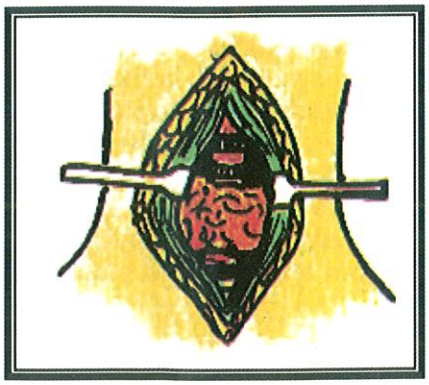
## Technique

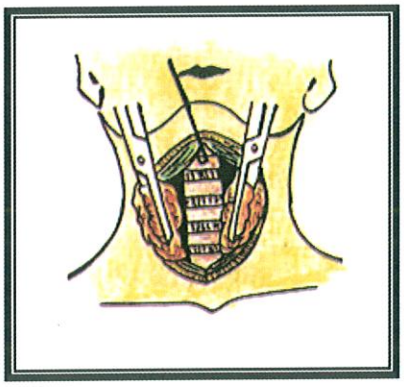
The operation is a semi-emergency one that is to be done under optimal conditions in the operating theatre. For extreme emergencies there are faster and simpler alternatives that will be mentioned later.

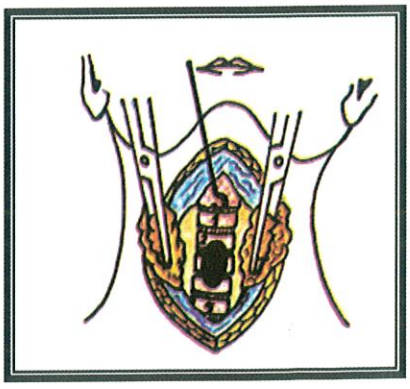
- **Aneasthesia:**
  Usually local (general in infants or no anaesthesia in comatosed)
- **Position:**
  The head and neck are hyperextended by a pillow beneath shoulders.
- **Incision:** A vertical midline incision from below the cricoid cartilage to suprasternal notch. The incision includes skin & platysma.



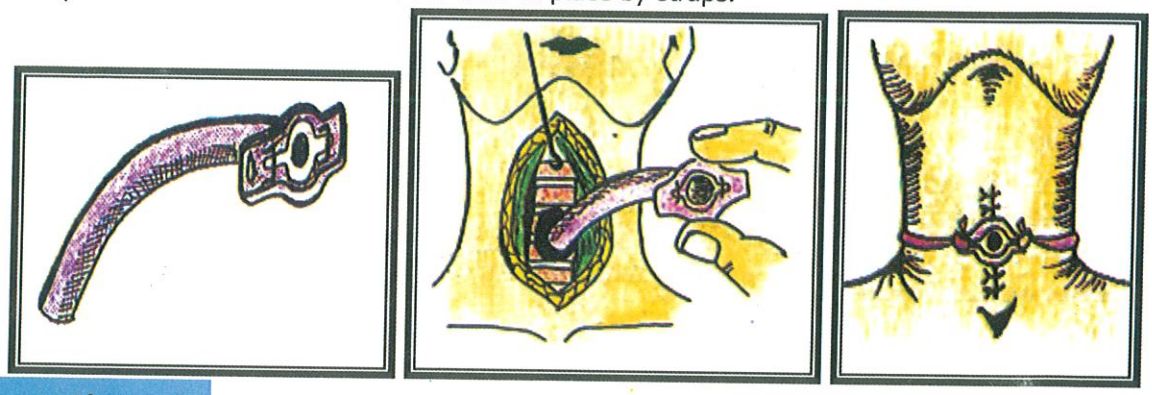
- The pretracheal muscles are separated in the middle line to expose the thyroid isthmus.
- The thyroid isthmus is clamped and divided.
- A narrow ellipse is removed from the anterior wall of the second, third, and found tracheal rings.







- A suitable sized tracheostomy tube is inserted.
- The wound is closed and the tube is fixed in place by straps.



## Postoperative care

1. Inspired air is warmed & humidified to avoid tracheal irritation.
2. $O_2$ & $CO_2$ inhalation to prevent apnea which often results from diminished CO2 in blood.
3. Inner tube is washed every 6 hours to avoid obstruction by secretion.
4. Tracheostomy tube is removed only if patient can remain comfort for 2 days with tube plugged.

## Complications

**[A] Early:**

1. Drying of secretions and obstruction of the tube.
2. Damage o the tracheal wall from prolonged pressure by the cuff.
3. Displacement of the tube into the tissues of the neck.
4. Surgical emphysema.
5. Wound infection.

**[B] Late:** Subglottic stenosis occurs if the tracheal incision involves the first tracheal ring.

## Alternatives to tracheostomy

1. In hospital or in an ambulance, the preferred method is **endotracheal intubation** either orally or nasally (in emergency cases).
2. In places where such facility is not available **cricothyroidotomy** is done:
   - The cricothyroid membrane is easily felt between the thyroid and the cricoid cartilages.
   - A knife is used to cut the skin and the membrane.
   - Any available tube is then pushed inside the trachea.
   - A less effective alternative is to insert 2 - 3 wide bore needles in the cricothyroid membrane.
   - When the patient reaches a hospital the cricothyroidotomy is replaced by either endotracheal intubation, or a tracheostomy.

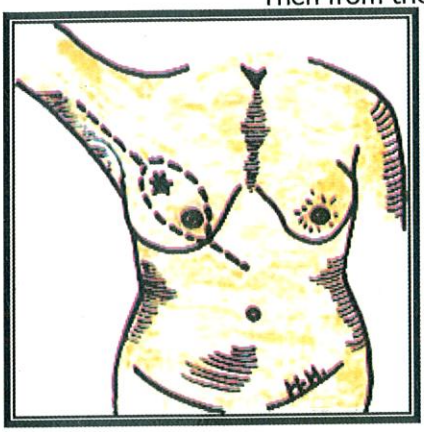
# RADICAL MASTECTOMY

## Indications

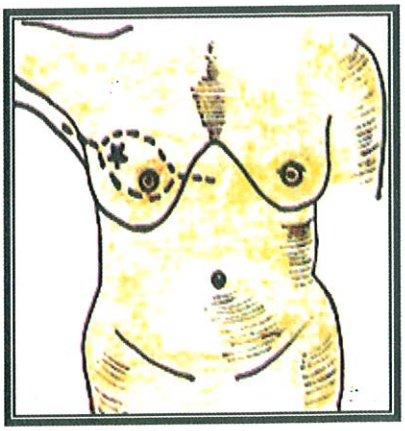
- Operable cases of carcinoma of the breast (T2N1M0 or less).

## Technique

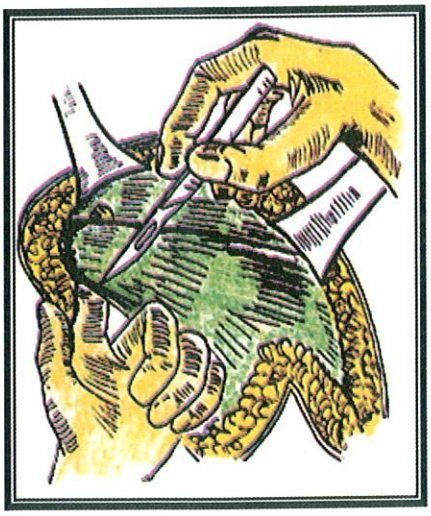
1. **Anaesthesia:** General.
2. **Position:** Supine, arm abducted.
3. **Incision:** Elliptical, including tumor area, nipple, areola & site of biopsy.
   Then from the angles of the ellipse either



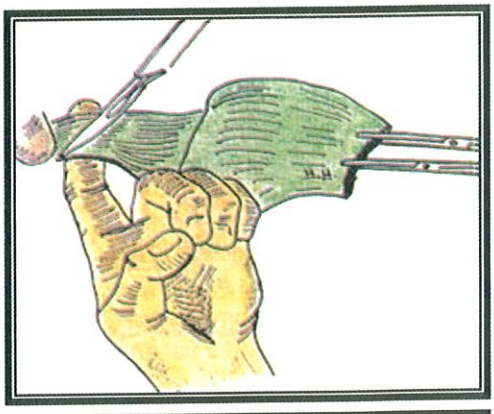
(a) Linear incision: Is extended from upper angle up along front of anterior axillary fold. Another linear incision is extended from lower angle down to epigastrium in midline.
(b) An improved cosmetic results are obtained with more transverse incision which extends medially to the middle line & laterally to the ant. border of latissmus dorsi m.

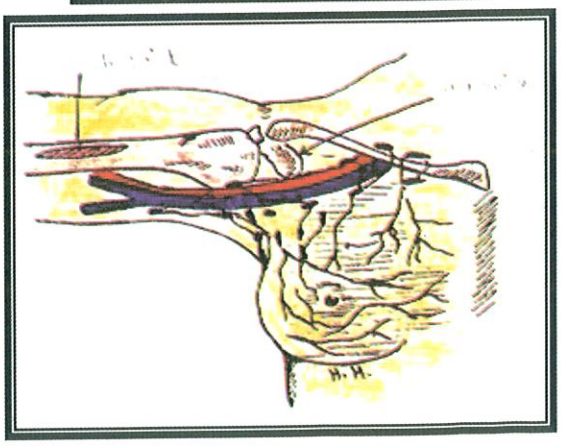


4. **Upper skin flap** is dissected up to clavicle: and lower flap down to expose upper 1/4 of rectus sheath.



5. **Axillary dissection:** To open axilla, tendons of pectoralis major and minor are divided near their insertions.

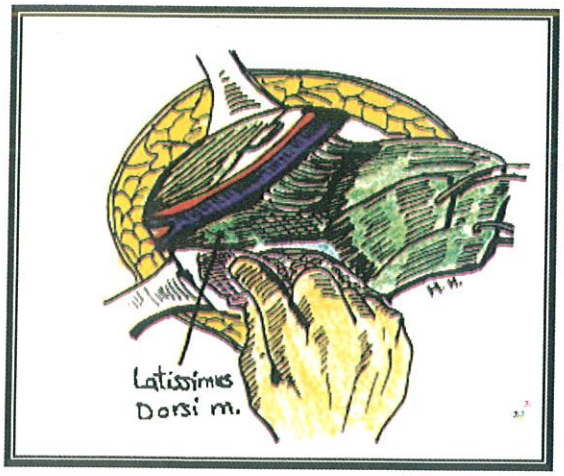




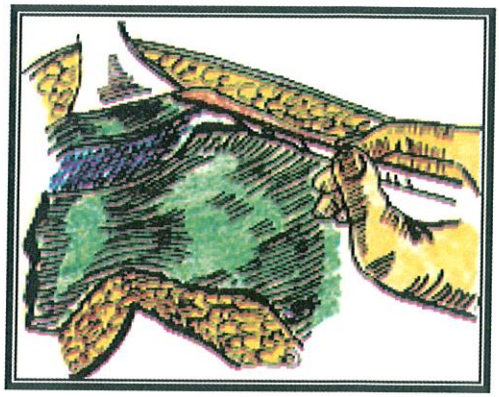
**N.B.:** Preserve the clavicular head of pectoralis major to:
1. Protect subclavian vessels.
2. Prevent infraclavicular hollowness.

All fat and nodes in axilla medial to axillary vein are dissected medially to be removed en-block with breast.

## 6. Breast dissection:

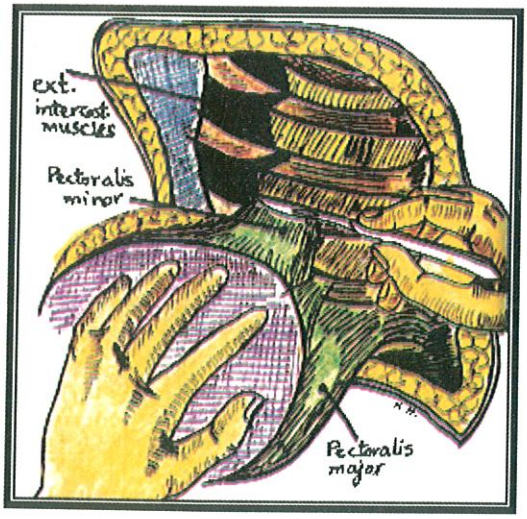


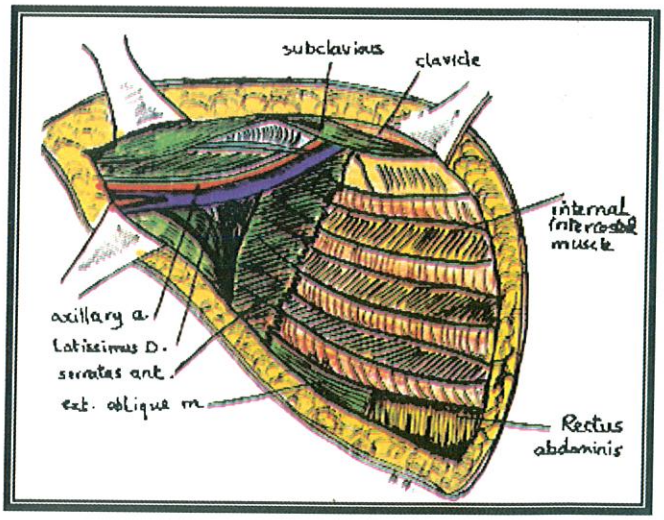

The cut ends of pectoralis major and minor are grasped with clamps to aid in retracting them downwards.



The **deep fascia** is then incised along the anatomical boundaries of the breast.

Working form axilla towards sternum, one keeps close to ribs and intercostal muscles, thus removing: Anterior part of serratus anterior, the 2 pectoral muscles and deep fascia from clavicle down to include upper 1/4 of rectus sheath and from latissimus dorsi to midline.



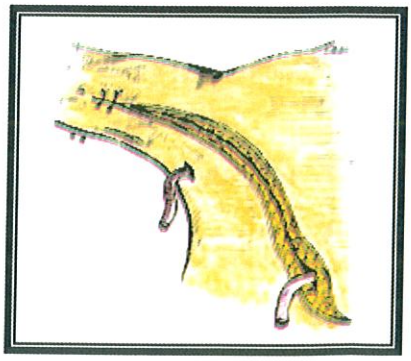




## 6. Closure:

Haemostasis is perfected.

Wound is closed leaving 2 suction drains.

If excess skiln was removed, the defect is covered by Thiersch (partial thickness) skin graft.



**N.B.: In radical mastectomy:**

**[A] Four structures are sacrificed: (3N + 1A)**

1. Intercostal nerve.
2. Acromiothoracic artery.
3. Lateral pectoral nerve.
4. Medical pectoral nerve.

**[B] Four structures are preserved: (3N + 1V)**

1. Axillary vessels and nerves.
2. Cephalic vein.
3. Nerve to latissimus.
4. Nerve to serratus anterior.

## Complications

**[A] During the operation:**

1. Shock.
2. Hemorrhage: From the breast, perforator as are major vessels.
3. Injury of important structures:
   - (a) Axillary vessels.
   - (b) Cephalic vein: If thrombosed with axillary vein: Brawny edema.
   - (c) Nerves of brachial plexus: Leading to paralysis of the arm.
   - (d) Nerve to latissimus: Paralysis of the latissimus.
   - (e) Nerve to serratus anterior: Winging of the scapula.
   - (f) Pleura injured during catching of a retracted perforator: Haemothorax.

**[B] After the operation:**

1. Infection.
2. Sloughing of skin flaps.
3. Chest complications.
4. Briedel's scar with limitation of arm mobility.
5. Recurrences in the scar, in the axilla, opposite axilla, lungs bones ... etc.
6. Brawny edema of the arm: Postoperative, dusky hard edema of the arm which may be due to:
   - (a) Impediment of the lymphatic drainage of the arm, by too thorough dissection of the axilla.
   - (b) Lymphangitis ending in obliteration of lymphatics.
   - (c) Thrombosis of both cephalic and axillary veins due to operative injury.
   - (d) Malignant infiltration and obstruction, of the remaining lymphatics.

Treatment of Brawny edema: Unsatisfactory.

- Elevation, bandage, diuretics. All the attempts should be directed towards prevention.

# Simple mastectomy (axilla is not disturbed)

## Indications

1. Palliative for inoperable cases, acute mastitis carcinomatosa, sarcoma.
2. Cystosarcoma phylloides.
3. Some cases of TB breast.

## Technique

1. **Anaesthesia:** General.
2. **Position:** Supine, arm abducted.
3. **Incision:** Elliptical, including nipple, areola and tumor area.From angles of the elips the incision is widen transversly as in Radical mastectomy.
4. **Skin flaps** are dissected from breast.
5. **Breast with or without underlying deep fascia is removed.**
6. **Perfect haemostasis and the wound is closed over a drain at its lower angle.**

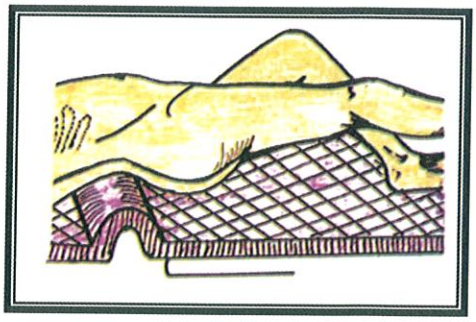
# The Kidney

## EXPOSURE OF THE KIDNEY

➢ **Anaestheia:** General

**There are two methods, the lumbar and the transabdominal.**

### (1) Lumbar Exposure (Posterior extraperitoneal approach):



This is the method of choice for most cases.

1. The patient is placed on the sound side the lower leg is flexed at the hip and knee, and the upper leg straight.
2. Table bridge is raised to open the space between last rib and iliac crest.
3. The upper limb on the sound side lies with the elbow flexed and the hand near the face and the upper limb on the diseased side is placed on an arm support.

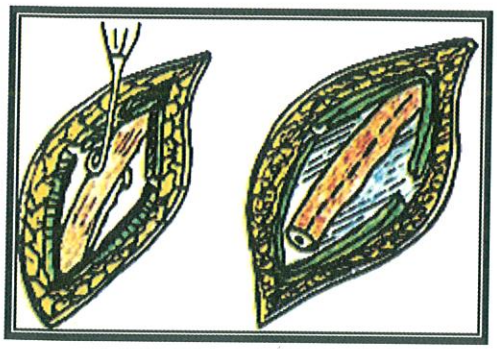
**Incision** **Lumbar incision of Morris' (renal or lumbar):**

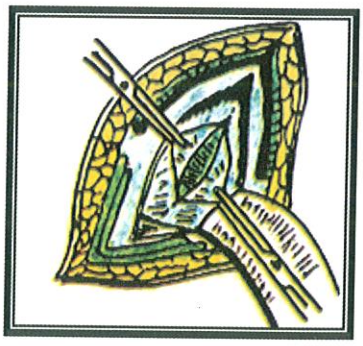
- It begins 1 inch below and lateral to the renal angle (to avoid pleura) to a point 1.5 inches above and medial to the anterior superior iliac spine (if necessary, it can be prolonged forwards in the same line as far as the lateral border of the rectus muscle). This incision is either straight below and parallel to the last rib or modified to S-shaped.

- The muscles divided are:
  - First layer: External abdominal oblique anteriorly and latissimus dorsi posteriorly.
  - Second layer: Internal abdominal oblique anteriorly and serratus posterior inferior posteriorly. Subcostal nerves and vessels deep to internal oblique are retracted downwards.
  - Third layer: Transversus abdominis anteriorly and lumbar fascia posteriorly. Avoid injury of peritoneum which is retracted forwards.

- If the exposure is inadequate , the last rib should be excised subperiosteally.

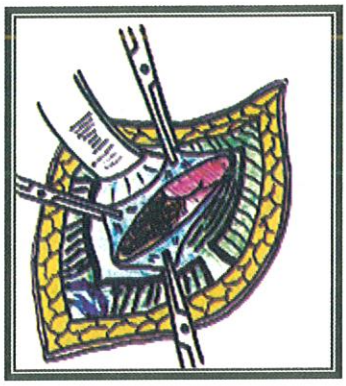
- The lumbar fascia is then incised and two fingers are inserted to peel the peritoneum from the undersurface of the transversus, which is divided.





**Delivery of the Kidney:**

1. The Zuckerkandl fascia is incised.

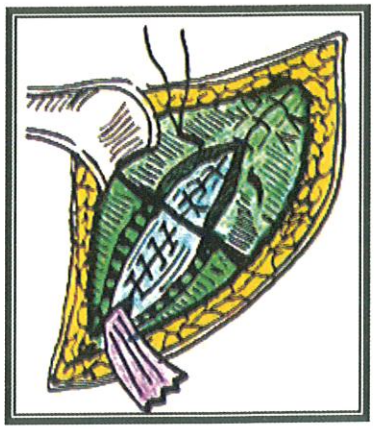


2. By finger dissection, the surrounding fatty tissue is cleared off the kidney.

3. The kidney can usually be delivered easily into the wound. The delivery may be assisted by two strips of gauze passed around the upper and lower poles ad crossed over the convex border.

**Closure**

- A corrugated rubber tube drain or tube drain is inserted down to the pedicle.
- The bridge of the table is lowered and the muscles are repaired in 3 layers the transversus with a continuous suture and each oblique muscle with interrupted sutures.
- Finally, the fascia and skin are closed.



## (2) Transbdominal Exposure Anterior Transperitoneal Exploration

- This exposure is particularly suitable for cases of rupture of the kidney and cases of malignant renal neoplasms.

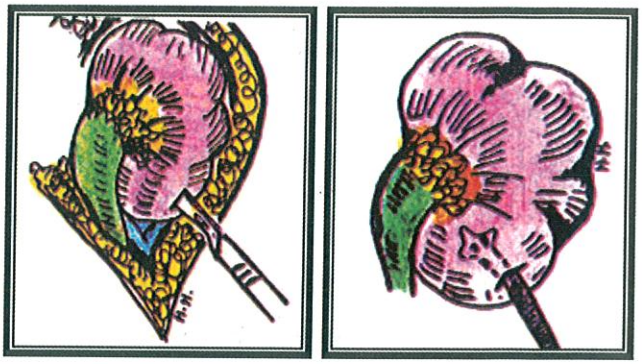
# NEPHROSTOMY

## Indications

1. Calculous anuria.
2. Hydroneophrosis or pyonephrosis.
3. Irremovable distal obstruction, e.g. ureteric stricture and carcinoma of the bladder.
4. After plastic operations on the renal pelvis.

## Technique

- It can be done either open or percutaneous. Open nephrostomy is very rarely done nowadays except as a part of open surgery e.g. after pyeloplasty.

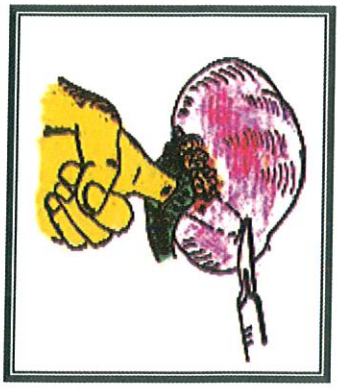


## Open Nephrostomy:

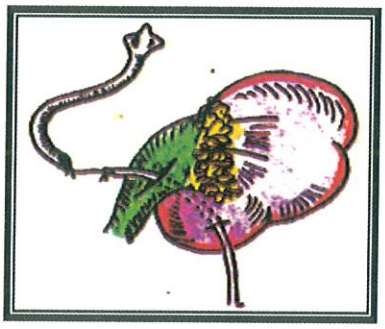
**[A] Routine Nephrostomy: (For kidney with gross hydronephrosis)**

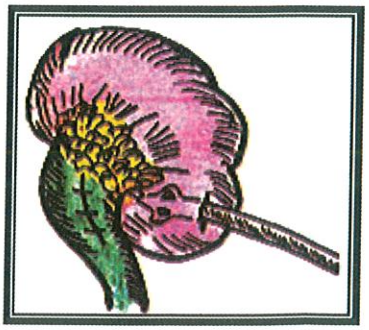
- If the kidney is grossly hydro-nephrotic: Its lower pole is exposed and a self-retaining catheter is introduced into the pelvis or lower calyx through a small nephrotomy incision.

**[B] Nephrostomy by Calot's technique:**



- If the kidney is relatively healthy: Cabot's method is employed to minimize damage to the renal cortex.
- The kidney is mobilized and an incision is made into the renal pelvis through which a finger is inserted into the lowest calyx.
- A small incision is then made in the renal cortex over the finger and an eyed probe is passed from the cortical to the pelvic incision.
- The outer end of the catheter is then attached to the probe which is drawn out through the cortical incision until the tip of the catheter lies within the pelvis.



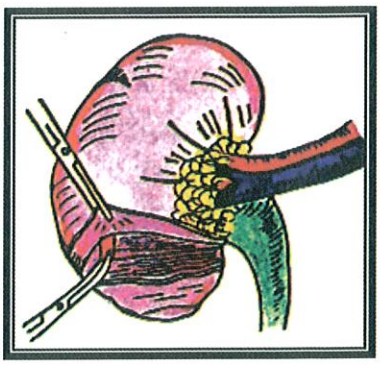


# NEPHRECTOMY

## Partial nephrectomy

### Indications

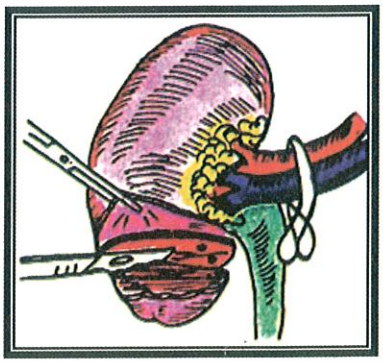
1. Stones in unhealthy calyx (usually lower calyx).
2. Benign solitary cyst of kidney.
3. Aberrant renal artery.
4. Avulsion of one pole of kidney.
5. Localized hydronephrosis.



### Operation

- Kidney is exposed as usual.
  The vessels supplying the lower calyx are ligated at the hilum.

The true renal capsule is incised and stripped upwards.

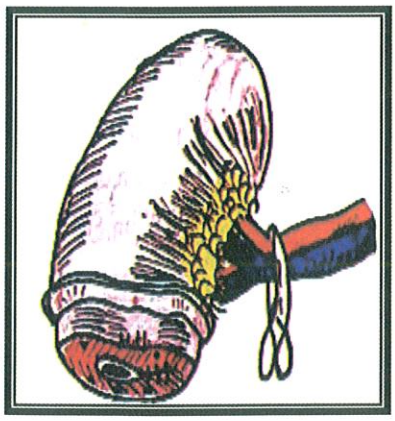


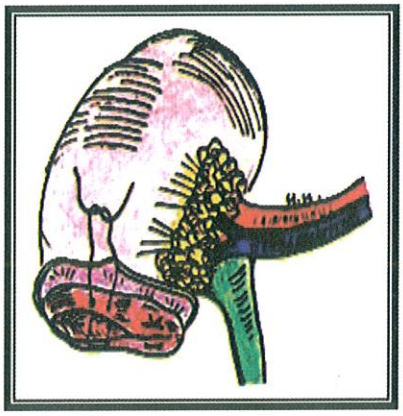
The kidney tissue is cut in a V-shaped manner.

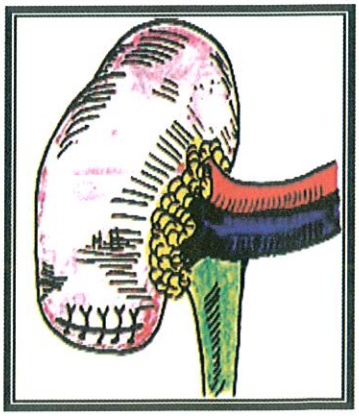
The calyx is sutured.

The kidney tissue is sutured and covered by the redundant capsule.

A drain is put and incision is closed.



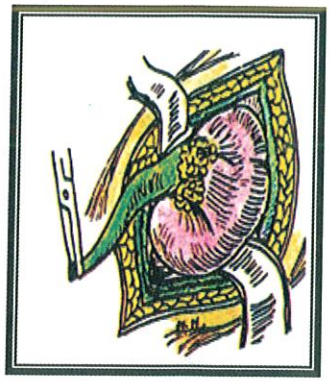




# Total Nephrectomy

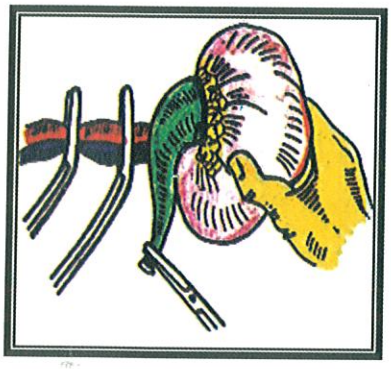
**Indications** Total nephrectomy is carried out for hopeless kidney function.

- **Provided that the other kidney is well-functioning.**
- Severe injuries, advanced hydronephrosis or pyonephrosis, renal tuberculosis, incurable renal or ureteric fistula, advanced calculous disease, malignant disease, uncontrollable haemorrhage or renal hypertension



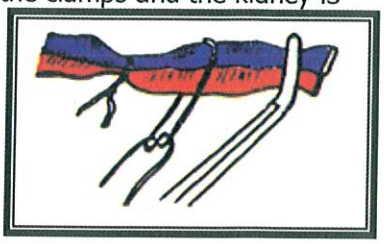
**Technique**

1. The ureter is identified and divided between two clamps as far away from the kidney as possible. Both ends are then lighted with catgut.



2. Two nephrectomy clamps are applied, one close to the kidney and the other far away. The pedicle is then divided distal to the clamps and the kidney is removed.

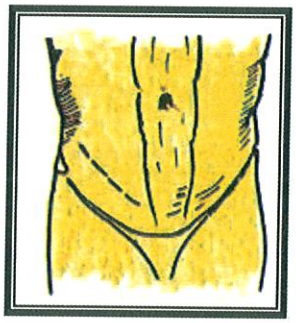
- A ligature is now passed round the pedicle proximal to both clamps, and the proximal clamp is removed. A second ligature is next applied distal to the previous, and the second clamp is removed.

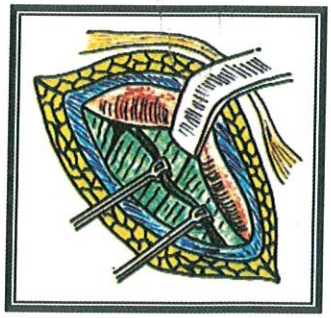


# Nephroureterectomy

**Indications**

1. Renal tuberculosis.
2. T.C.C of the renal pelvis.
3. Pyoureter - pyonephrosis.
4. Advanced hydroureter-hydronephrosis.
5. Squamous cell carcinoma in renal pelvis.



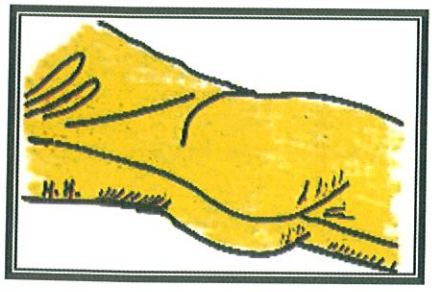


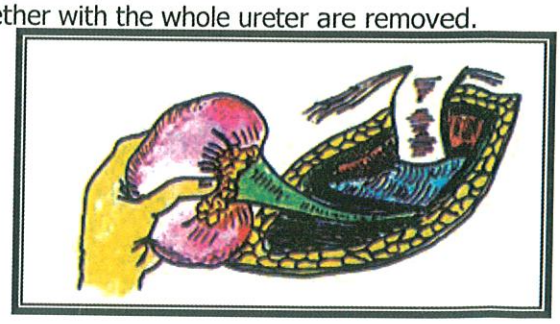
**Technique**

Two incisions are usually employed:

1. A small suprapubic, midline or Abernathy's incision, through which the ureter is divided and ligated at its entrance to the bladder.

2. A lumbar incision through which the kidney, together with the whole ureter are removed.





# REMOVAL OF RENAL CALCULI

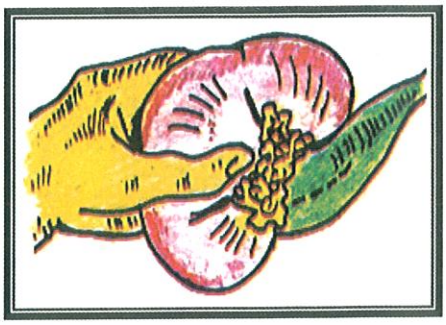
- Depending on the number, size and location of the calculi, one of three methods is employed:

## 1. Pyelolithotomy (Removal of a stone through an incision in the pelvis):

- This is the method of choice for stones lying within the renal pelvis and for calyceal stones which can be dislodged from the calyces into the renal pelvis.

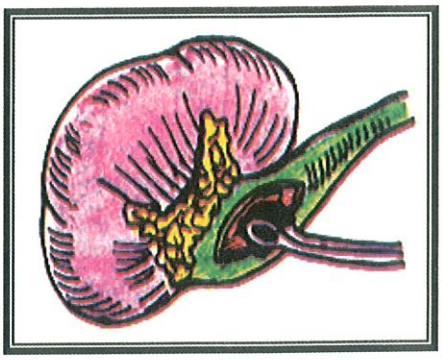
### Technique

- The posterior surface of the kidney is exposed (to avoid injury of renal pedicle).



- The stone is palpated and the posterior surface of the kidney and renal pelvis are cleared from fat by gauze stripping away from the hilum..

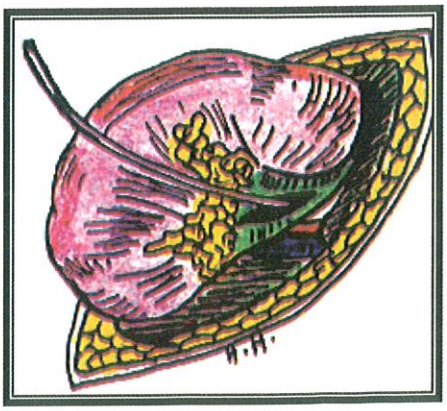
- The stone is steadied in the renal pelvis & incision is made in the posterior wall of the pelvis on the long axis of renal pelvis (to avoid injury of renal vessels anteriorly).



- Gil-Vernet retractor is very useful in this step to retract the renal parenchyma and expose the renal pelvis.

The stone is removed by a stone forceps.

- After removal of the stone the pelvi-ureteric junction and the ureter are explored by passing a bougie (dilator) to ensure their patency.

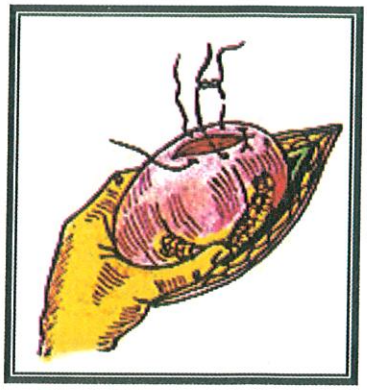


- The pelvis and calyces are then flushed with saline to remove any debris or clots.

- The incision in the pelvis is better approximated by few interrupted stitches by4/0 vicryl.
  It may be left open if there is technical difficulties in closing it.

## 2. Nephrolithotomy:

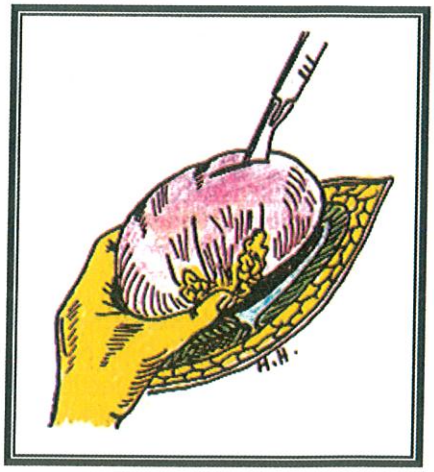
### Indications



1. Calyceal stones which can be palpated through the cortex.
2. Branched claculi which cannot be delivered through the pelvis.
3. Failure to expose the pelvis e.g. because of short pedicle, intrarenal pelvis, congenital anomalies (such as horse-shoe kidney).

**Operation** Same steps till the kidney is delivered. Then either:

1. Radial incision directly on the stone avoiding injury of radial vessels.
2. Incision in **the Brodel's line** (1/2 cm inner and parallel to the convex border of the kidney) as it is least vascular part and to avoid injury of marginal artery.



- The kidney incision is then sutured with plain catgut, in mattress sutres with or without a muscle graft.
- A drain is put.

### Drawbacks

1. Bloody.
2. Fibrosis around the incision and sutures with loss of kidney parenchyma.
3. Further stone formation.

## 3. Pyelonephrolithotomy:

### Indications

1. Stone in pelvis + stone in kidney.
2. Stage Horn stone difficult to get from the pelvis.

**Operation** Pelvic and kidney incisions done as usual.

- Avoid extending the pelvic incision into the kidney to avoid injury of the Marginal artery.

# Complications of Kidney Operations

## [A] During Operation

1. **Shock.**
2. **Haemorrhage from kidney or pedicle.**
3. **Injury of:**
   i. Pleura: hissing sound, closed immediately.
   ii. Peritoneum: Closed immediately or peritonitis may follow.
   iii. Intercostal vessels & nerves leading to bleeding and paralysis of part of rectus and incisional hernia.
   iv. Inferior vena cava in right kidney operation.
   v. Duodenum and colon resulting in fistula.

## [B] After Operation

1. **Haemorrhage:**
   (a) Reactionary: During the first 24 hours. Re-explore and ensure haemostasis.
   (b) Secondary: After 7-10 days, due to infection. Treated by:
      i. Bed rest.
      ii. Morphia.
      iii. Massive antibiotics.
      iv. Coagulants.
      v. Blood transfusion is the most importnat single item. Most cases will improve. If bleeding continues, Nephrectomy is obligatory but is hazardous due to friability of tissues.
2. **Infection:** Ascending pyelonephritis, perinephric abscess.
3. **Pulmonary complications.**
4. **Renal Fistula:**
   Considered as such if site of drain brings urine for more than 3 months. It is due to:
      i. Obstruction below.
      ii. Severe infection.
      iii. Specific pathology (T.B., Tumour).
      iv. F.B. left behind.

   Treatment:
      (a) Remove the cause.
      (b) Nephrectomy if intractable.
5. **Ostemoyelitis:** does not discharge urine, but pus + X-ray.
6. **Recurrent stones.**
7. **Incisional hernia.**
8. **Other complications of major operations:** e.g. paralytic ileus, gastric dilatation etc.

# SURGICAL TREATMENT OF STONE URETER

## Exposure of ureter then according to the site of the stone:

1. **Stone upper 1/3:** Pyelolithotomy through a lumbar incision Morris' incision.
2. **Stone middle 1/3:** Abernathey's operation.
3. **Stone lower 1/3:**
   - i. **Above ischial spine:** Abernathey's operation.
   - ii. **Below ischial spine:** Exposed by lower midline subumbilical suprapubic incision or pfannenstiel incision.
   - iii. **Intramural stone:** Middle line transvesical meatotomy.

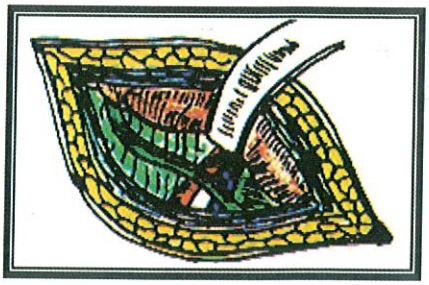
## Abernathey's Operation

**Anaesthesia** General or spinal.

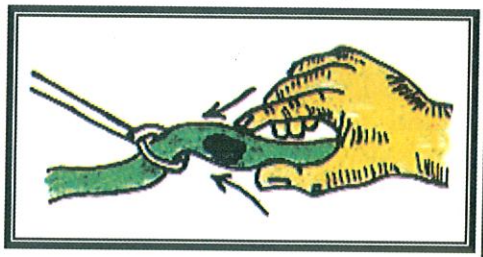
**Position** On the back, supine.

**Incision**

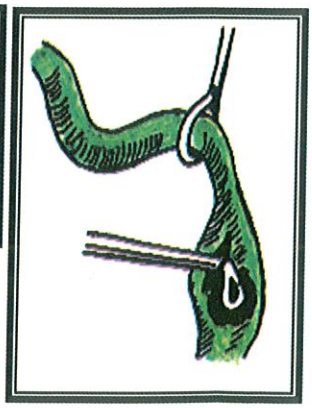
- Oblique muscle cutting, begins 1 ½ inches above & medial to the anterior superior iliac spine, descends downwards and medially to a point I inch above the midinguinal point.
- The 3 abdominal muscles and the transversalis fascia are divided in the same direction of the incision.
- The peritoneum is stripped upwards and medially from the iliac fossa until the psoas muscle is exposed and the ureter is identified:
  1. Crosses the bifurcation of common iliac artery.
  2. White tubular structure.
  3. Peristaltic waves.
  4. Contains the stone.
  5. Blood vessels arranged longitudinally along its course.
  6. Aspiration reveals urine.



- The ureter is mobilized for few cms, and is steadied by a ring forceps which also prevents slipping of the stone upwards, and prevent urine flow.

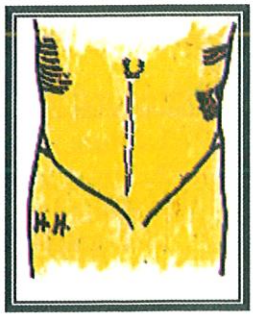


The stone is milked upwards and the ureter is incised above the site of impaction (the ureter is not incised at the site of impaction of stone to avoid post-operative stricture).



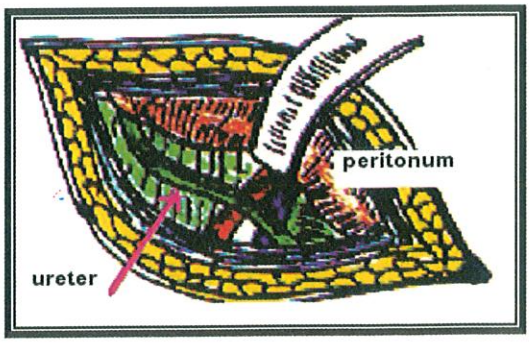
- Stone is removed with a stone forceps. A sound (dilator) is passed downwards into the bladder to ensure absence of distal obstruction and to detect any stricture (should be dealt with). Ureter is closed using vicryl 4/0 and a drain is inserted down to it.
- Close the inner layer: Transversus and internal oblique.
- Then the external oblique and finally the skin.

## Middle line exposure of the ureter



- Middle line incision form the umbilicus to the symphysis pubis, through the skin, linea alba.
- If not entered, the middle line is identified by the insertion of the pyramidalis.

- The 2 recti are separated, the peritoneum is peeled from the iliac fossa, ureter is identified.




### Closure

- The 2 recti are approximated. The linea alba is closed. A retropubic drain is inserted and another one down to the ureter. The skin is then closed.

## Transvesical meatotomy

- Through a middle line incision, the 2 recti are separated. The peritoneum is peeled upwards. The bladder is identified by:
  1. Thick muscle wall.
  2. Brick red colour.
  3. Perivesical plexus of veins. The anterior wall is incised, the ureteric orifice is identified and slit by diathermy & the stone is removed. The bladder is closed around a self retaining catheter. A drain is inserted in the retropubic space. The wound is closed.

### Post operative care

1. Retropubic drain removed after 48 hours.
2. Self retaining catheter removed on the 7th - 10th post operative day.
3. Skin stitches removed on the 8th - 10th post operative day.

### Complications of Ureter operations

**[A] During operation:**

1. Shock.
2. Haemorrhage.
3. Injury of: (a) Peritoneum. (b) Ureter. (c) External iliac vessels.

**[B] After operation:**

1. Reactionary and 2ry haemorrhage.
2. Infection.
3. Paralytic ileus.
4. Pulmonary complications.
5. Ureteric fistula (see renal fistula for causes).
6. Incisional hernia.

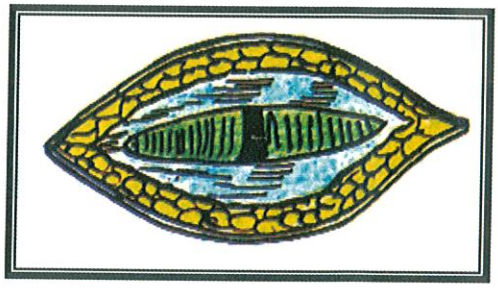
# SUPRAPUBIC CYSTOLITHOTOMY

**Anaesthesia** General or spinal.

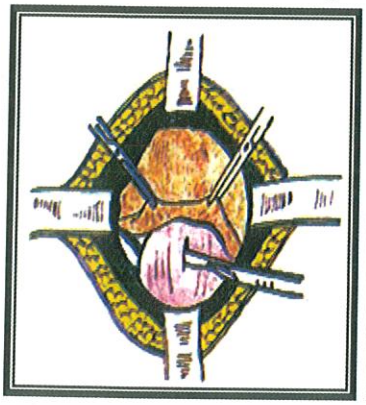
**Position** Supine.

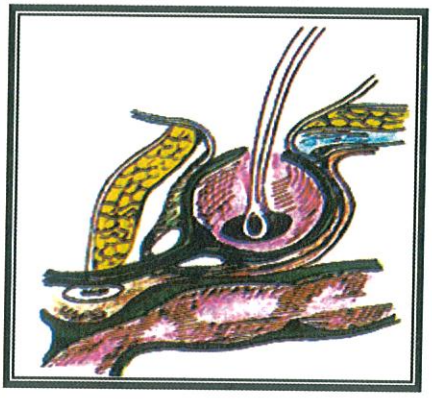
**Incision**

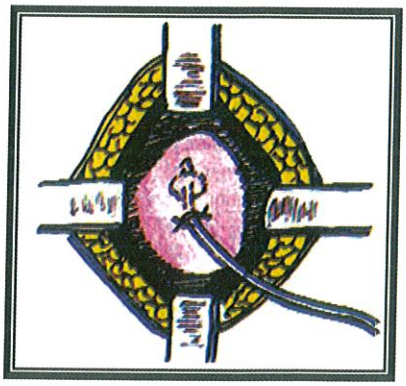
- Either a lower median suprapubic subumbilical incision or a Transverse Pfannenstiel incision; at the upper border of the mons veneris incising both skin and anterior rectus sheath transversely.
- The 2 recti are separated longitudinally.



- The peritoneum is peeled off the bladder which is identified and incised longitudinally.
- The bladder is explored and the stone is removed with a stone forceps.
- The bladder is closed in two layers around a self retaining catheter, the inner one of plain and the outer of chromic catgut.







# SUPRAPUBIC CYSTOSTOMY

## Indications

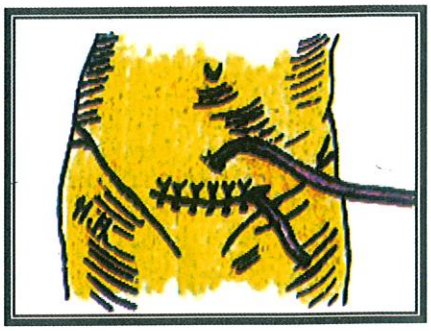
1. Relief of acute retention if catheterization fails.
2. Removal of vesical calculi (cystolithotomy).
3. Excision of vesical diverticulum or localized tumors.
4. Transvesical prostatectomy.
5. Treatment of bladder neck obstruction.
6. To allow healing of urethra e.g. after urethroplasty, urethrotomy or rupture urethra.

- **It can be done either open or percutaneous (using cystocath).**

## Open method

- The same as suprapubic cystolithotomy, but the bladder is closed on a self-retaining rubber catheter.

- The cave of Retzius is drained, the 2 recti are approximated, the anterior rectus sheath closed as well as the skin.



## Post operative

1. Urine is collected in a glass receptacle.
2. Drain is removed after 48 hours.
3. Catheter removed after 7 days.
4. Stitches are removed on the 10th psotoperative day.

## Complications of Bladder Operations

**[A] <u>During operation:</u>**

1. Injury of peritoneum.
2. Bleeding from bladder perviesical venous plexus.

**[B] <u>After operation:</u>**

1. Infection: Ascending or descending.

2. Pulmonary complications particularly in old patients.

3. Osteitis pubis: A painful condition due to injury of symphysis pubis. It may be cured by sedatives, antibiotics & bone curettage.

4. Persistence of suprapubic fistula which may be due to:
   (a) Infection. (c) Specific pathology as T.B. or tumour missed behind.
   (b) F.B. (d) Missed distal obstruction.

5. Incisional hernia.

# MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA

## ⌦ Surgical treatment:

### Indications

1. Distressing frequency.
2. Difficulty in micturition:
3. Acute retention of urine (If more than one attack).
4. Chronic retention with residual urine more than 200ml (Residual urine can be estimated by sonar or by post micturition cystography).
5. Haematuria.
6. Presence of a complication as cystitis, diverticulae, stone or back pressure effects on the upper urinary tract.
7. Uroflowmetery study shows less than 15 ml/sec.

### The idea of surgery

Is to remove the adenomatous enlargement from inside the false capsule of compressed prostatic tissue.

### Methods

1. Endoscopic surgery.
2. Open surgery.

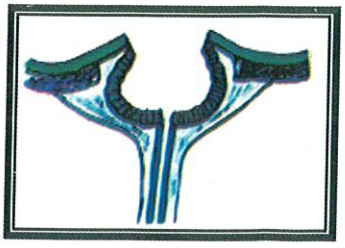
**The general idea in any prostatectomy for BPH is to remove the adenoma from within the false capsule i.e. actually it is adenectomy.**

## [A] Endoscopic Surgery

**1. Trans-urethral resection (T.U.R.):**

- Indications: The commonest method used nowadaysfor most patients.
  Using the cysto-resectoscope, the prostate is removed piece by piece by diathermy knife.
- Contraindications: - Large adenoma.
  - Associated pathology requiring open surgery.
- Advantages: - Minor technique, minimal hospitalization, minimal post-operative pain, less morbidity and mortality and early return to work.

**٢. Visual laser Ablation of the prostate (V.L.A.P.):**



Through the cystoscope, a non-contact laser probe is used to evaporate the obstructing tissue.

- Advantages: Bloodless procedure with post-operative results similar to T.U.R.
- Drawback: The adenoma is not totally removed, with higher incidence of recurrence.

**3. Transurethral vaporization:**

Using high energy electric heating current.

# [B] Open Surgery

## Indications

1. Large adenomas (unfit for T.U.R).
2. Mainly middle lobe enlargement.
3. Bladder pathology that needs surgery at the same time e.g. a diverticulum or a big stone.

## Methods

### I. Transvesical prostatectomy (Freyer's operation):

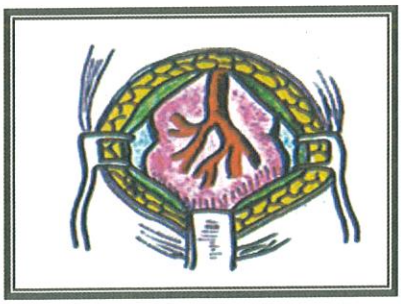
- **Position:** Supine.
- **Anaestheisa:** General or spinal.
- **Incision** : Midline or suprapubic.
- The urinary bladder is exposed and opened longitudinally.
- The index finger is inserted into the bladder-neck, and the adenoma (enlarged transition zone) is enucleated.
- Haemostasis is secured using diathermy and figure eight sutures at the bladder-neck at 5 and 7 O'clock positions (Prostatic arteries).
- The bladder closed after inserting a Foley's catheter and a suprapubc tube.

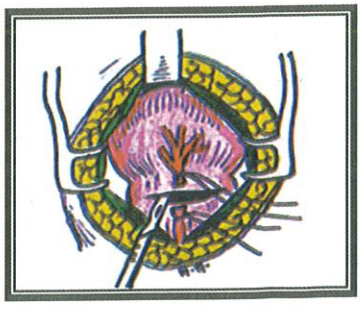
### II. Retropubic (Millin's Prostatectomy)

## Indication

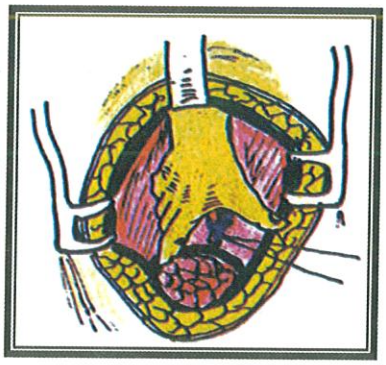
When the transvesical route is not indicated.

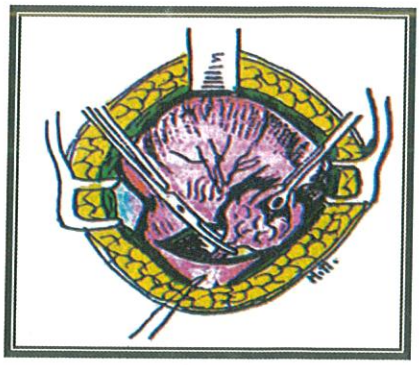
- **Advantage**: Direct access to prostate, better haemostasis, no suprapubic drain and convalescence is usually shorter.
- **Incision**: Midline or Pfannenstiel
- The prostate is exposed retropupically, but the bladder is not opened.
- A transverse incision is done directly through the capsule of the prostate.



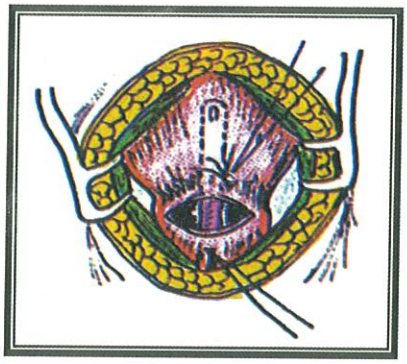


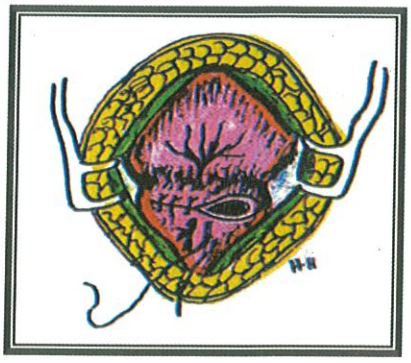
- The adenoma the adenoma is enucleated and haemostasis is secured under direct vision by suture and diathermy.





- A foley's catheter is inserted and the capsule is closed.





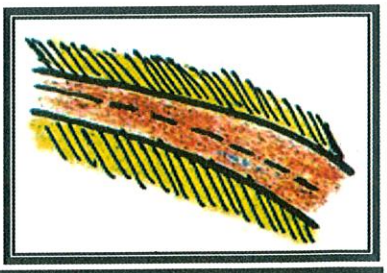
## Complications of surgery

1. **Bleeding:** This may be reactionary or secondary. Clot retention may occur.
2. **Incontinence** occurs in one every 10.000 cases.
3. **T.U.R. syndrome:**
   This is dilutional hyponatraemia that rarely follows transurethral resection as a result of over absorption of irrigating fluid. The use of glycine for irrigation lessens this possibility.
4. **Retrograde ejaculation** due to damage of the internal sphincter.
5. **Impotence**
   May occur in 2-5% of patients due to injury of pudendal nerve fibers in the region of the posterior urethra.
6. **Infection** leading to urethritis, cystitis or epididymo-orchitis.
7. **Urethral stricture.**

# RIB RESECTION

## Indications

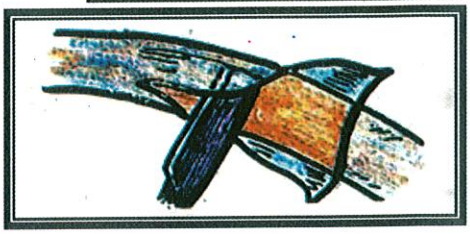
1. **Disease of the ribs:**
   e.g. Chronic osteomylitis, T.B. osteomylitis, Operable tumors of the rib, Cervical rib syndrome.
2. **Diseases of the pleura:**
   e.g. Chronic empyema, T.B. empyema, as a part of decortication for clotted haemothorax or neglected empyema, or in thoracoplasty
3. **Diseases of the lung:** e.g. Drainage of lung abscess, Resection of the lung in bronchiectasis, T.B. and Operable tumors of the lung.
4. **Diseases of the oesophagus:** e.g. Tumors or stricture.
5. **Disease of the heart and big vessels.**
6. **Thoraco-abdominal approach:** e.g. for tumors of oesophagus and cardia of stomach.
7. **Exposure of the kidney.**
8. **Drainage of liver and subdiaphragmatic abscess.**

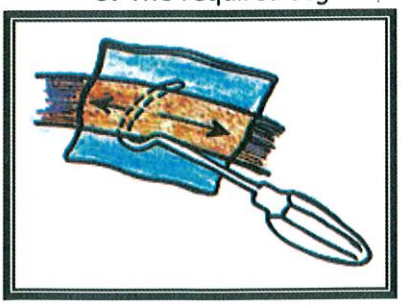


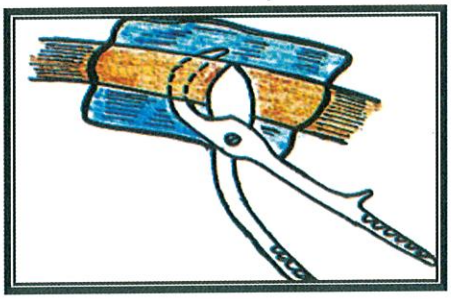
## Technique of rib resection

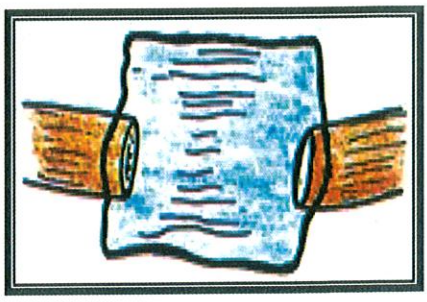
- **Anaesthesia:** General anaesthesia or intercostal nerve block.
- **Steps:**

1. Skin incision in the same direction of the rib.
2. Outer periosteum is incised in the same direction.
3. The periosteum is stripped by **periosteal elevator**.
4. A **Doyan raspatory** is passed around the rib from below upwards (to avoid injury of intercostal vessels). The posterior periosteum is stripped by the raspatory
5. The required segment of the rib is resected by **rib shear**.









## Modifications

1. **In T.B. rib:** the posterior periosteum although is affected by T.B. is not removed to avoid contamination of the pleura. The retained periosteum is sterilized by carbolic acid and is dusted by streptomycin.
2. **In malignant tumours of the rib:** the rib is resected with its ant. And post. Periosteum and as a safety margin the intercostal muscles and a rib above and below are resected also. The defect in the chest wall is closed by fascia lata graft.
3. **In cervical rib syndrome:** Remove the rib with its periosteum to prevent its regrowth.

# AMPUTATIONS

## Indications

1. **Trauma:**
   A) Immediate (primary) amputation: Done for:
      - Crushed limb ----- crush syndrome.
      - Fractures with injured main vessels or nerve.

   B) Delayed (secondary) amputation: Done for complications:
      - Gas gangrene.
      - Ischemic gangrene from injury, ligation or compression of a main vessel.
      - Uncontrollable secondary haemorrhage.
2. **Deformities:** Multiple marked deformities may render the limb hopeless.
3. **Gangrene:** Ischemic gangrene, gas gangrene,.....etc.
4. **Malignant tumors of a limb.**
5. **Infections:**
   - Severe bone or joint infection.
   - Madura foot.
   - Extensive infection of the limb with septicemia e.g. in diabetic foot.
6. **Useless limb:**
   When diseased limb may be considered inferior to artificial limb.
   e.g.: - Flail limb as in poliomyelitis or other nerve lesions.
   - Chronic osteomyelitis.
   - Severely painful limb.

- **It has to be stressed that the decision to perform an amputation should never be taken lightly and a second opinion is always recommended.**

## Types of amputation

### [A] Provisional:

Performed when primary healing is unlikely to occur.

- The amputation is performed at the lowest possible sit, so that if further amputation is necessary, it will result in a stump of adequate length.
- Free drainage should be provided by employing either the guillotine method or better a circular or flap amputation without closure.

### [B] Definitive:

Performed when primary healing is most likely to occur.

➢ ***Types of definitive amputation:***

**1. End bearing amputation:**

- It is performed when weight is to be taken through the end of a stump, therefore.
- The scar must not be terminal and the bone end must be solid not hollow which means it must be cut through or near a joint.
- Examples are through knee and Syme's amputation.

**2. Non end bearing amputation:**

- It is the commonest variety: All upper limb and most of lower limb amputations come into this category.
- In these amputations the weight of the body is transmitted by way of the artificial limb socket to structures other than the stump end.

## The ideal stump should fulfill the following requirements:

### 1. Length:

The length of a stump is an advantage because a short stump is liable to slip out of the prosthesis, but a non end bearing stump should be 3 inches shorter than the entire bone to give room for the artificial joint e.g. in above knee operation the ideal length is 11 inches from greater trochanter and the minimum is 6 inches (to allow sufficient adduction power and to ensure good vascularity of the flap which is supplied by profunda femoris).

Below knee stump:

- Optimum length is 6 inches from joint line.
- Minimum length is 2 inches from joint line.

### 2. Shape:

The stump should be smoothly rounded and conical in shape neither bulbous nor pointed.

### 3. Coverings:

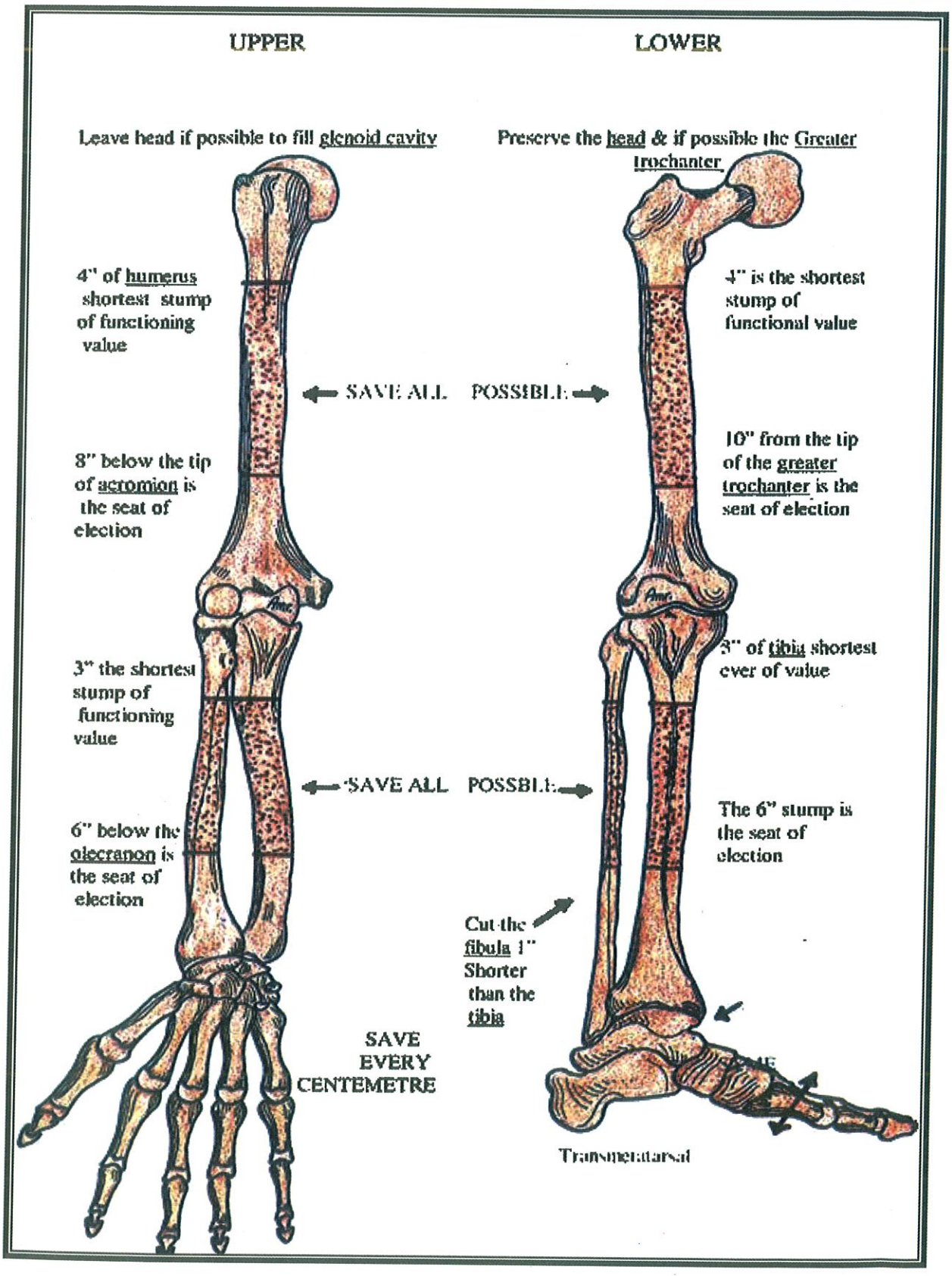
The bone should be covered with subcutaneous tissues and deep fascia to ensure mobility of the skin. Muscles are not sutured over bone as they turn into fibrous tissue causing adherent painful scar.

### 4. Scar:

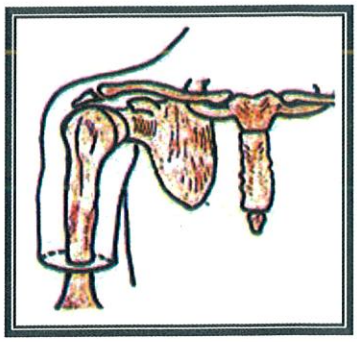
It should be linear, freely movable and not exposed to pressure. Satisfactory in the upper limb but not in the lower limb when the stump is end bearing.

### 5. Function:

"The stump should be painless with a freely movable joint above and a smooth bone end below".


UPPER
LOWER
Leave head if possible to fill glenoid cavity
Preserve the head & if possible the Greater trochanter
4" of humerus shortest stump of functioning value
4" is the shortest stump of functional value
SAVE ALL POSSIBLE
8" below the tip of acromion is the seat of election
10" from the tip of the greater trochanter is the seat of election
3" the shortest stump of functioning value
3" of tibia shortest ever of value
SAVE ALL POSSBLE
6" below the olecranon is the seat of election
The 6" stump is the seat of election
Cut the fibula 1" Shorter than the tibia
SAVE EVERY CENTEMETRE
Transmetatarsal

## Techniques of Amputation

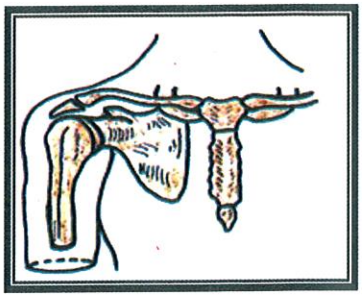


**1. Guillotine method:**

All the tissues are divided at the same level and the bone end is left exposed on the cut surface.
It is rarely employed nowadays except in extreme emergencies.

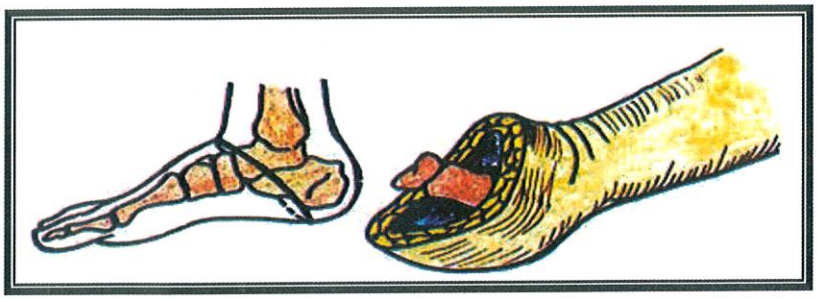
**2. Circular method:**

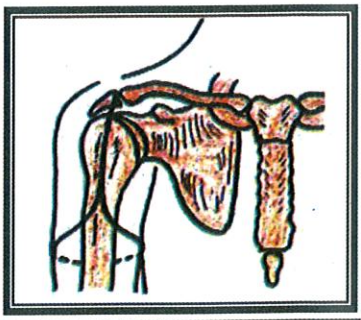
The amputation is done through a circular incision distal to the level of bone section.



**3. Oblique method:**

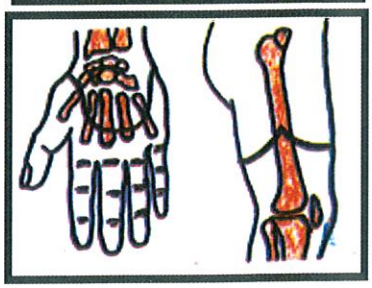
An oblique elliptical incision is made with its upper end above the level of bone section and its lower end lower than this level by a distance equal to the diameter of the limb. This method is employed in Syme's amputation.





**4. Racket method:**

In this method a straight incision is carried proximally as the handle of the racket from a circular or elliptical incision is carried proximally as the handle of the racket from a circular or elliptical incision which represents the blade of the racket. This is employed in disarticulation of the toes or fingers.



**5. Flap method:**

The most popular method is to use flaps which may be single or two flaps which may be equal (in upper limbs and in above knee amputation) or unequal (in below knee amputation).

**Position** Supine.

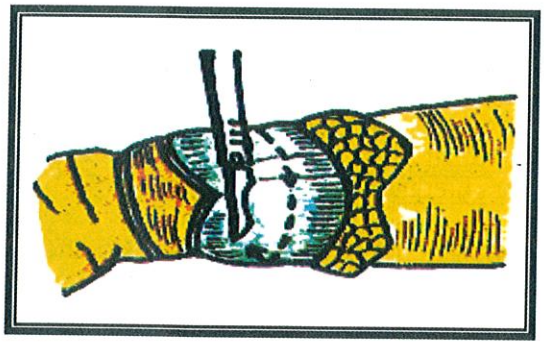
**Anaesthesia** General or spinal.

## Characters of flaps

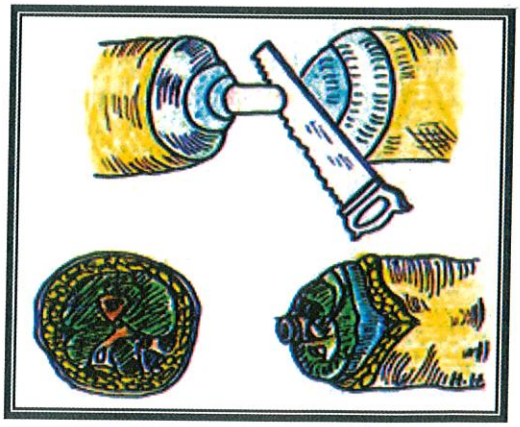
- **The following rules should be respected in making the flaps:**
  1. The length of a single flap or the combined length of the two flaps should be equal to the diameter of the limb at the level of bone section.
  2. The breadth of equal flaps should be equal to half the circumference of the limb but when unequal flaps are used the shorter flap should be broader than the other.
  3. The flaps should be semicircular rather than rectangular in shape since a conical rather than a cylindrical stump is desired.
  4. The flaps should consist of skin and deep fascia with some muscle tissue at their bases but no muscles should be placed over bone end.
  5. The flaps should be antero-posterior so that the scar will be transverse.

## Technique

1. A tourniquet is used unless there is arterial insufficiency.
2. As a rule anterior and posterior flaps of equal length are used in the upper limb and for above knee amputation. In below knee amputation a long posterior flap is usual.
3. Muscles are divided distal to the proposed site of bone section; subsequently the opposing groups are sutured over the bone end to each other.



4. Nerves are divided proximal to the bone cut.
5. The main vessels are tied.
6. The bone is sawed at the proposed level after division of the periosteum. If two bones are present, the smaller one is divided at first.
7. The tourniquet is removed and every bleeding point is meticulously ligated.
8. The skin is sutured carefully without tension. Suction drainage is advised and the stump firmly bandaged.



## Postoperative care

1. Fixation of the limb: For at least 10 days by a posterior slab.
2. Dressings: The drain is removed after 24 - 48 hours without removal of the dressing which is kept until the stitches are removed after 10 -14 days.
3. Soon after operation, the patient is moved out of bed on crutches.
4. Exercises: After 10 days to strengthen the muscle.
5. Artificial limb: Permanent artificial limb is fitted after complete shrinkage of the stump 6 month after operation.

## Complications of Amputation

**[A] Early soft tissue complications:**

1. **Haematoma:** It is prevented by good haemostasis, wound drainage and pressure bandage.
2. **Infection**: It may cause sloughing of flaps, bone necrosis, delayed wound healing and adherent painful scar. Immediate drainage of the wound is needed.
   - Gas gangrene: Clostridia spores from the perineum may infect a high above knee amputations.
3. **Sloughing of flaps:** Due to vascular insufficiency, tension in the skin or infection of wound.

**[B] Late soft tissue complications:**

1. **Adherent painful scar:** Should be avoided by preventing haematoma or infection, no muscles over bone end and separate closure of deep fascia.
2. **Skin callosities, bursae or ulcers at pressure points.**
3. **Redundant soft tissue** from using long flaps or weight gain.

**[C] Nerve complications:**

1. **Phantom limb:** Feeling of amputated limb. It is due to stimulation of cerebral presentation of the limb by impulse from divided nerves. It disappears gradually.
2. **Stump neuroma.**
3. **Causalgia:** It is a severe burning pain due to formation of artificial synapses between efferent sympathetic and afferent sensory fibers. It is usually relieved by sympathectomy.

**[D] Bone complications:**

1. **Bone necrosis:** Due to wound infection or excessive stripping of periosteum.
2. **Spur formation.**
3. **Projection of bone ends:** From using short flaps or bone growth in children. Reamputation is essential.

**[E] Joint complications:**

**Deformity** of related joint may occur.

# Amputations of the lower limb

## 1. Syme's Amputation:

- It is disarticulation at the ankle with removal of the 2 malleoli and articular surface of the tibia.

### Advantages

1. It is an end bearing amputation and it allows the patient to walk without a prosthesis (artificial limb).
2. It maintains the pleasure of earth feeling.
3. The weight of the body is taken on skin which is used to pressure.

### Disadvantages

1. It is liable for ulceration as it is end bearing and often necessitate re-amputation.
2. The prosthesis (elephant foot) is an ugly one.
3. It is unsuitable for old patients (bad blood supply) and in females (due to its bad appearance).

**Technique** Two points are taken:

**[A] The tip of external malleolus.**

**[B] A point one finger breadth below and behind the tip of the internal malleolus.**

- These two points are joined by 2 incisions down to the bones one across the front of the ankle (one inch above joint line) and the other incision below the heel (3/4 inch in front of the point of the hell).
- The foot is disarticulated in front at the ankle.
- The calcaneum is dissected out from the heel flap dividing the tendo-Achillis.
- Avoid injury to blood supply of the flap from the lateral calcanean branch of the peroneal artery and the medial calcanean branch of the medial planter artery.
- The soft parts are turned up from the malleoli and the ends of the tibia and fibula cut off one inch above articular surface.
- The flaps are then sutured and the wound is drained.

## 2. Below knee Amputation:

### Level of amputations

- The bones should be cut in the middle third (not less than 2 inches from the insertion of biceps femoris and better to be one patient's hand breadth below the tibial tuberosity.

### Skin flaps

- unequal flaps with long posterior and short anterior flaps are used. The flaps should include the deep fascia, and on the medial side where the deep fascia is deficient over the tibia, the periosteum should be included in the skin flap.
- The fibula is cut first as it is the weaker bone and should be divided one inch higher than the tibia to obtain a conical stump. The sharp anterior margin of the tibia is beveled by oblique saw cut before division of the tibia.
- Anterior and posterior tibial and peroneal vessels and the two saphenous veins require ligation, before closure.

## 3. Above Knee Amputation:

- Site of election 11 inches below greater trochanter in the middle third of the femur but not less than 6 inches.
- Flaps used are equal antero-posterior flaps with a long anterior and short posterior flaps.
- After division of femur the linea aspra is bevel

# LUMBAR SYMPATHECTOMY

To be effective, it should be pre-ganglionic.

## Indications for Sympathectomy

1. **Vascular conditions:**

   (a) Raynaud's disease: Sympathectomy is very effective in the early stages. Pain is completely relieved but attacks of cyanosis may still occur.

   (b) Buerger's disease: The operation relieves the pain and promotes healing of ulcers but relapses after 2 or 3 years are common.

   (c) Chronic ischemic ulcers.

   (d) Rest pain.

   (e) With direct arterial surgery: To improve peripheral run-off.

   (f) With amputation for vascular disease: To ensure healing of the wound.

2. **Hyperiderosis of the hands or feet:** To relieve excessive sweating.

3. **Painfull conditions:** To interrupt afferent fibers in angina pectoris, malignancy, dysmenorrhea, causalgia, Sudek's atrophy, pelvic visceral pain (e.g. carcinoma of urinary bladder or rectum).

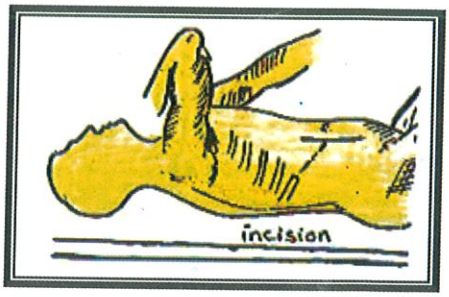
## Contraindications

1. Intermittent claudication (worsen the muscle ischemia).
2. Massive gangrene (ineffective & needs amputation).
3. Diabetic patient (auto sympathectomy).

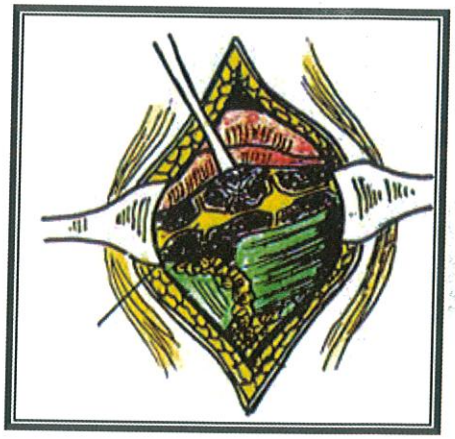
- The pre-ganglionic fibers for the lower limb pass through the lower thoracic and upper two lumbar nerves to the corresponding ganglia of the sympathetic trunk and descend in the trunk to synapse in the lower lumbar and sacral ganglia. Excision of the lumbar chain constitutes a preganglionic denervation of the lower limb.
- Pre-ganglionic denervation of distal part of lower limb should consist of excision of L2, 3, 4 sympathetic ganglia. Avoid injury of Li ganglion bilaterally (one side should be preserved) to maintain ejaculation, or L5 ganglion which supply pelvic organs.
- Effect: It has no effect on the vessels of muscles but causes vasodilatation of skin and subcutaneous vessels ------ intermittent claudication does not improve but improve only mild rest pain, ulcers or trophic skin changes.

## Technique

- **Position:** Supine with the side of the operation raised 30°. The patient lies partly on the opposite side.
- **Anaesthesia:** General.
- **Incision:** From the tip of the last rib to the border of the rectus in the direction of the umbilicus.



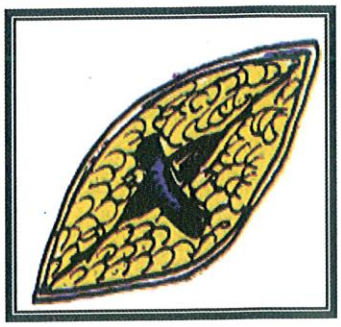

- The muscles are divided in the line of the incision.
- The peritoneum is stripped inwards to expose the inner border of the psoas major muscle.
- The sympathetic chain lies in the groove between the vertebral bodies and psoas muscle, on the right side it is overlapped by the IVC.
- The trunk is excised from above the second lumbar ganglion (Behind the third part of the duodenum) to below the fourth ganglion (overlapped by the common iliac vessels).
- Lumbar veins may cross the trunk and must be carefully ligated as they pass directly to IVC.



- **Take care not to mistake lymph nodes, lymphatics, genito-femoral nerve (over psoas), psoas minor tendon or tendinous strip of psoas major for sympathetic chain.**
- Both sides can be done in one setting.
- Tests to cases that may benefit from sympathectomy:
  1- Reflex vasodilatation.
  2- Spinal anaesthesia or Para-vertebral block.

# MINOR SURGICAL PROCEDURE

## VENOUS CUT-DOWN



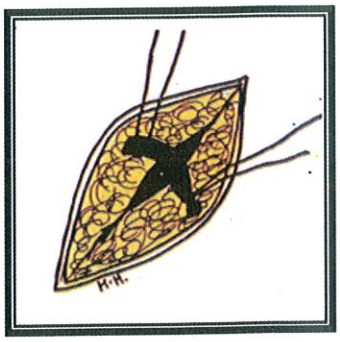
**Indications** Shocked patient as the veins are collapsed.

- **The cephalic veins are preferred to the long saphenous as the latter is better left for possible arterial reconstruction later on. Technique is the same.**

**Anaesthesia** Local infiltration.

**Incision**

a) Transverse, 1 inch above the radial styloid process (in case of cephalic vein).
b) 1 inch above and in front of medial malleolus (in case of long saphenous vein).

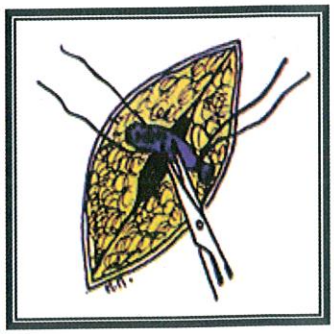


**Technique**

1. Identify vein and ligate it distally using chromic catgut (2/0).

**N.B.:** In case of long saphenous vein, protect long saphenous nerve.

2. Pass a chromic catgut ligature around the vein proximally **but do not tie it.**

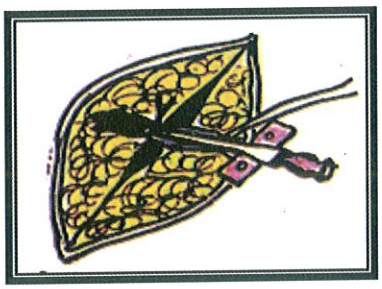


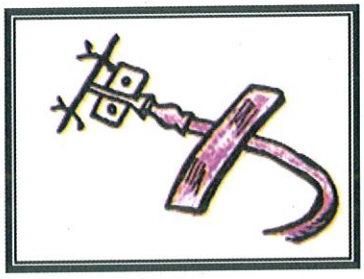
3. Incise the vein longitudinally or transversally for 1 to 2mm.

4. Introduce the canula into the vein and tie the proximal ligature.

**N.B.:** Canula may be introduced directly to the vein without incising it.

5. Close the incision by interrupted silk stitches (2/0).
6. Fix the canula to the skin.





**Complications**

1. Bleeding.
2. Infection & thrombo-phlebitis
3. Injury of the saphenous nerve

# INGROWING TOE NAIL

## Incidence & Definition

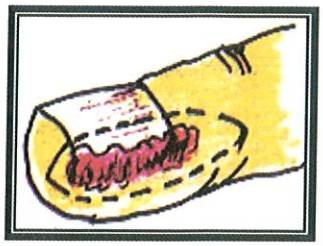
- A common problem in which a sharp edge of the big toe nail grows inwards into the adjacent skin fold.
- Young males predominate.

## Predisposing factors

1. Faulty nail trimming: Trimming of the nail sides obliquely may leave behind a sharp spike that starts the condition.
2. Tight shoes.

## Treatment

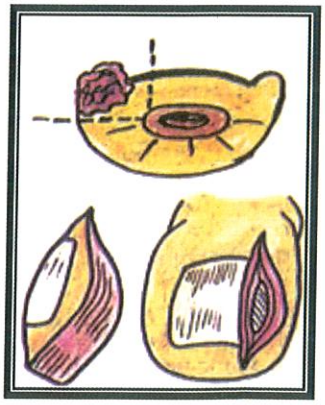
1. **Conservative treatment: indicated in early cases**
   - The aim is to lift off the nail spike: A pledget of gauze soaked in an antiseptic is inserted beneath the ingrowing part of the nail.
   - The pledget is changed daily.
   - The patient is instructed to avoid tight shoes, and is shown the proper technique of square nail trimming.
2. **Surgery:**
   - Indicated for failure of conservative treatment, and for suppurative cases.



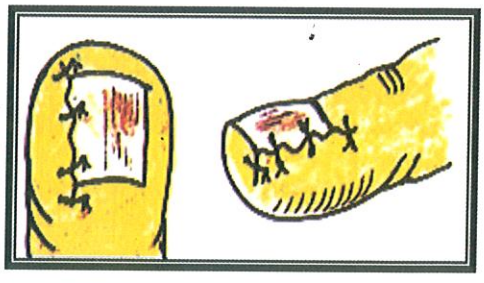
➢ **Wedge resection**

- **Position:** On the back.
- **Tourniquet:** On toe near its base.
- **Anaesthesia:** General or local (without adrenaline).

- **Incision:**
  - A longitudinal incision is made through the affected side of the nail down to the bone and extend proximally to the nail root.
  - Another incision is made through the skin by the side of the lesion down to the phalanx
  - The wedge of tissue between the two incisions is excised, leaving bare bone without any remnant of the germinal matrix.



  - The gap may be left open to granulate or may be closed with 2 or 3 interrupted sutures.
  - Pressure dressing is applied



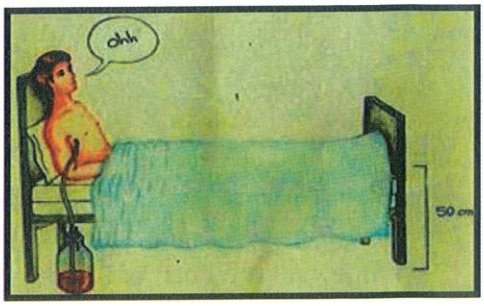
# UNDERWATER SEAL

**Definition** Special method to drain pleural cavity to inter-costal (chest) tube which ends under surface of water in special bottle.

**Advantage** It allows exist of pleural contents (blood, air or pus).
As its end is under surface of water, air cannot enter pleural space.
Thus, gradual lung expansion occurs as pleural contents are evacuated.

**Indications**

Pneumothorax, Haemothorax, empyema &after thoracotomy.




**Technique**

- Sterile intercostal (chest) tube is used. Its end which will be passed to pleural cavity is beveled doubly to make it pointed, and then side hole is made just near tip.
- Drainage site (usually 5$^{th}$ space midaxillary) is infiltrated with local anaesthetic.

1. Small stab is done, and the tube is pushed up in pleural cavity.
2. Other end of tube is passed under surface of water in special bottle. Bottle should be always 50cm (at least) below patient's chest so that intrathoracic negativity cannot suck its contents.
3. Short column of water corresponding to intrathoracic negativity rises up tube and oscillates with respiratory movements.
4. Drainage must be helped by chest exercises.
5. As lung expands, pleural contents are expelled into chest tube and nothing returns, sot that complete expansion is rapidly achieved.
6. Chest X-ray is done daily to follow lung expansion.
7. During changing bottle or moving patient to X-ray department, chest tube must be clamped until its end is again under surface of water and the bottle 50 cm below patient's chest, to avoid sucking air or water into pleural cavity. For this reason, 2 clamps should be always besides patients.

**Removing chest tube**

- Is done when all pleural contents are expelled and lung is fully expanded as proved by X-ray.
- Chest tube is pulled out and chest wound is sealed immediately by stitching and putting adhesive plaster.

# TRACHEAL INTUBATION

## Indications

1. For administration of general anesthesia.
2. To allow for mechanical ventilation in cases of respiratory failure.

## Technique

1. Frequantly an induction agent is used.
2. Position:supine with flexion of the neck & extension of the head.
3. Gentle downward pressure on the thyroid cartilage facilitate the intubation.
4. The laryngoscope handle is grasped in the left hand &the blade is gently placed in the right side of the mouth.
5. The tongue is moved to one side of the oral cavity while advancing the blade towards the larynx.
6. The entire laryngoscope is lifted straight anteriorly to expose the vocal cords.
7. With the cuff deflated, the tube is passed under vision into the right side of the mouth &through the vocal cords.
8. The endotracheal tube is placed so that the cuff is just distal to the cords.
9. The balloon is inflated with 5-10ml of air.
10. The correct position is checked .the chest is inspected for symmetrical movements with insufflation of air &breath sounds are auscultated.

## Compilcations

1. Minor lacerations to the tongue ,lips &gums.
2. Dental damage.
3. Esophageal intubation.

# CENTRAL VENOUS CATHETERIZATION

## Indications

1. Central venous pressure monitoring.
2. Parenteral nutrition.
3. Long-term infusion of drugs,e.g.,cytotoxic agents.

## Contraindications

1. Coagulopathy.
2. Burns or skin infection at the site of entrance.

## Technique of subclavian vein catheterization

1. Position is supine with head down tilt.
2. Local infiltration of xylocaine at an an area 0.5cm below the clavicle & 2cm lateral to its junction with the 1st rib.(always aspirate before injection).
3. A wide needle is attached to a syringe and is used to puncture the skin in the anesthetized area while aspirating ,the needle is advanced slowly horizontally(parallel to the floor)in the direction of the suprasternal notch entry into the subclavian vein is signed by free aspiration of blood.
4. The syringe is removed while keeping a finger over the needle to avoid air embolism.
5. A Guide wire(J wire) is passed through the needle with its tip directed towards the heart . The needle is kept in place until the wire passes into the vein (Seldinger technique) the wire must pass without resistance.
6. The needle is then removed and the central venous catheter is introduced over the guide wire to the length of 15cm on the right &18cm on the left.
7. The wire is removed. the catheter flag is sutured to the skin &the area is covered by a sterile dressing.
8. A chest x-ray confirms placement into superior vena cava &rule out pneumothorax.

## Technique of internal jugular vein catheterization

1. Position supine with head tilt. the patient's head is turned 45 degree contralatrally.
2. The area to be anaesthetized is at the middle of post, border of sternomasoid muscle which is grasped firmly and is elevated slightly to fix the internal jagular vein.
3. While maintaining aspiration the needle is passed slowly deep to the muscle in a direction between its sternal and clavicular heeds.
4. Other details of the technique are the same as for subclavian vein catheterization.

## Complications

1. Arterial puncture.
2. Air embolism.
3. Pneumthorax caused by pleural injury.
4. Malpositioning.
5. Infection, causes septicemia: the catheter should be removed and sent for culture and sensitivity.

# URETHERAL CATHETERIZTION

## Indication

1. Urine retention.
2. Urine output monitoring for a critical patient.
3. Irrigation of blood clots e.g after prostatectomy.
4. To allow healing after open urinary bladder surgery or after minor extraperitoneal ruptures.
5. Intravesical chemotherapy for superficial bladder cancer.
6. As a stent after urethral surgery. 7-For cystourethrography.

## Contraindications

Suspected uretheral injury. suspicion is raised by either:

1.Blood at urethral meatus.

2. Perineal ecchymosis.

## Technique

➢ **For men**

1. Sterile gloves are used. a disinfectant solution is applied to the external genitalia.
2. Injection of 10ml of sterile xylocaine gel through the meatus facilitates the procedure.
3. The penis is held with the left hand, & and is placed on a stretch perpendicular to the body to straighten the ant. Urethra.
4. A well lubricated foly catheter(size 16 f is recommended for an adult) is held in the right hand introduced through the meatus and is advanced gently and steadily up the urethra until both the hub of the catheter is reached and urine is returned.
5. The balloon is inflated with 10ml saline.
6. The catheter is connected to a urine collection bag.

➢ **For women**

1. Supine position with the hips flexed &abducted and the knee flexed.
2. The left hand spreads apart the libia minora to expose the uretheral meatus and the right hand passes the catheter upto the bladder.
3. There is no need to pass the catheter up to its end.

## Complications

1. Uretheral injury particularly in cases with prostatic enlargement.
2. Excessive dieresis after relief of acute retention may produce hypovolemia.
3. Urinary tract infection.

# NASOGASTRIC TUBE

## Indications

1. Aspiration of upper GI contents in patients with acute gastric dilatation, paralytic ileus, intestinal obstruction, gastric outlet obstruction or acute pancreatitis.
2. Upper GIT bleeding.
3. Enteral feeding.

## Technique

1. While the patient is supine or sitting, ask him to flex the neck.
2. The tube is lubricated, introduced into a patent naris, and is advanced posteriorly into the nasopharynx.
3. The patient is asked to swallow. with swallowing the tube is advanced to the esophagus & then into the stomach.
4. Placment in the stomach is confirmed by aspiration of gastric contents or by auscultation of injected air.
5. The tube is carefully taped to the nose in a way not to press on the naris.
6. The tube is connected to a collection bag, low intermittent suction is applied as well. Patency is ensured by injecting 20ml saline/4h.

## Complications

These are usually minor but then get commoner with prolonged use of the tube.

1. Ulceration & necrosis of naris.
2. Oesophageal reflux , esophagitis, esophageal erosion and esophageal stricture.
3. Mouth breathing ,mouth dryness &possibly parotitis.
4. Interferance with ventilation & cough, retention of bronchial secretions ,atelectasis.
5. Loss of fluids.

# LAPAROSCOPIC SURGERY

*"It must be noted that ,this is only a brief introduction about laparoscopic surgery"*

## General consideration in laparoscopic surgery.

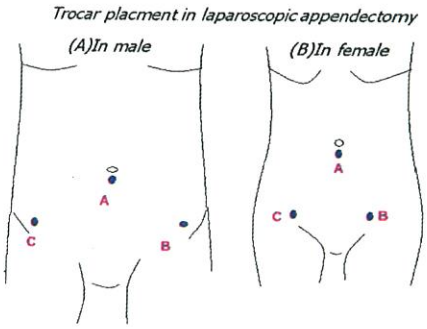
1. Place ports in a tri angulated fashion on both sides of the scope.
2. Laparoscopes are classified into:
   a. Straight
   b. Angled(30 degree or45 degree): allows you to effectively look around the corners.
3. Suturing is done by a special needle but normal needle can be used.
4. Some surgeons place a clip over the knots of a tied suture for extra security & also serves as radio opaque marker.
5. Laproscopic assisted procedures are those in which a small incision is made for specimen removal or for anastomosis.

## Port planning

It refers to the steps & consideration taken before inserting the actual ports in order to:

1. Optimize the usability of the placed ports.
2. To minimizes patient morbidity.
3. Considerations includes
   a. anatomic landmarks.
   b. Presence &location of the scars.

As a result of this planning, the surgeon should have a clear concept about each ports location; size & intended use.




### Common examples of laparoscopic procedures

1. Laparoscopic cholecystectomy.
2. Laparoscopic appendectomy.
3. Laparoscopic inguinal hernia repair.
4. Laparoscopic surgery of the spleen.
5. Laparoscopic repair of ventral & incisional hernia.
6. Laparoscopic Nissen fundoplication.
7. Exploratory laparoscopy & lysis of adhesions.
8. Laparoscopic lumbar sympathectomy & laparoscopic Celiac plexus block.

### Common examples of pediatric laparoscopic procedures

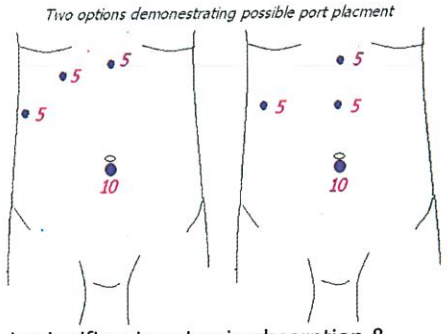
1. Laparoscopic pyloromyotomy.
2. Intestinal atresia repair.
3. Intestinal malrotation (ladd procedure).
4. Esophageal-gastric fundoplication.
5. High ano-rectal malformation.
6. Hirschsprungs diseases.
7. Diagnosis and treatment of impalpable undescended testes.

## Surgical technique in laparoscpic cholecystectomy

### (1) Patient positioning

1. Patient is placed in supine position.
2. The operating surgeon stands to the patient's left.
3. The camera operator stands to the surgeon's left.
4. The assistant on the patient's right.
5. The primary video monitor is placed on the patient's right at the level of the shoulder.

### (2) Introduction of the initial trocar



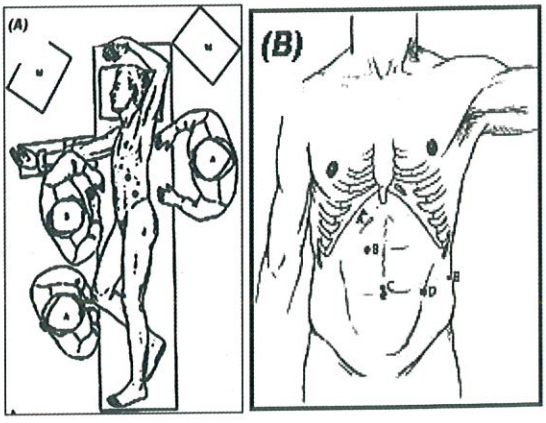
Two options demonestrating possible port placment

1. In patient's without previous surgery near the umbilicus, the 12mm is placed through a 10:15mm transverse or vertical incision through or adjacent to the umbilicus.
2. The location may be altered in certain circumstances such as obesity, previous abdominal surgery.

### (3) Generation of pneumoperitoneum

1. Traditionlly CO2 is used but the gas is highly soluble & may result in significant systemic absorption & academia in prolonged cases.
2. In the majority of patients, this is well tolerated & can be minimized by increasing the ventilation.
3. Alternatrive gases are available such as nitrous oxide which can be used in patient who may not tolerate the CO2 load (sever respiratory or cardiac disease).
4. Placment of accessory trocers.
5. Dissection & division of cystic duct & artery.
6. Intraoperative cholangiogram.
7. Dissection of the gallbladder from the liver bed.
8. Extraction of the gall bladder.

## Laparoscopic surgery of the spleen




1. There are 2 major surgical approaches for laparoscopic splenectomy:

**A. Lateral approach:**

Of choice in most cases ,3 (*12mm*) trocars are used anteriorly along the left costal margin & the 4th is placed post. to the iliac crest.

**b. Anterior approach:**

Only used in special circumstances (huge spleens). The patient is placed in the modified lithotomy position.

2. Hand assisted laparoscopic spleenectomy: refers to laparoscopic procedures performmed with the aid of a plastic device inserted in 7,5 to 10cm wound.

***Most of surgeons agree that the non-dominant hand should be used in the device.***

## Sympathectomy & laparoscopy

### ➢ *Celiac plexus block*

- It is an excellent palliative procedure, which is indicated in many patients with pancreatic cancer presenting with pain or develop abdominal pain at some points in the course of the disease.
- Celiac plexus consists of 2 ganglia that lay on either sides of the aorta at the level of the celiac trunk.
- There is a complex network of neural fibers at this level within the peri-aortic fat pad.
- Under direct visualization the needle is passed into the peri-aortic fat pad on both sides & 20cc of 50% ethanol is injected as a sclerosing agent.

### ➢ *Lumber sympathectomy*

1. Indicated for cases of arterial occlusive disease, causalgia.
2. An incision is made halfway between he iliac crest & the costal margin in the anterior axillary line.
3. There is 2 or 3 additional trocers are placed in mid & posterior axillary lines.
4. There are 5 lumber ganglia: L2& L3 ganglia carries sympathetic innervations to the foot & lower leg. Proximal leg is innervated from L1 to L4.
5. The sympathetic chain is located on the front of the vertebral column:
   On the left, lateral to the aorta & on the right, just behind the edge of the IVC.
6. To complete the sympathectomy, the communicating rami & vessels should be clipped & divided.
7. The crossing lumber vessels at the sacral promontory can be used as a landmark.
8. Alternatively the entire lumber sympathetic trunk can be excised.

***NB:***

### ➢ *Natural orifice transluminal endoscopic surgery( NOTES)*

- By using flexible endoscopes& laparoscopic like flexible instruments.
- Through natural orifice (mouth- vagina- anus).
- Procedures that were done by using NOTES include:
  1. Transgastric appendectomy.
  2. Transvaginal cholecystectomy.
  3-Trans gastric cholecystectomy.

### ➢ *Surgical Robotics*

1. The ***Da Vinci surgical system*** is the only tele-robotic system approved by the FDA for clinical use that commercially available at the time of this writing.
2. Robotes are not an accurate label;
   The more accurate description is ***computer-assisted telemanipulator***.
   It isn't a robot because it takes independent motions or pre-programmatic action.
3. The computer enhances the interaction between the surgeon & the bedside robotic device by eliminating tremors & scaling all motions to a selected degree.
   This makes very fine & precise movement of the surgical instruments possible.